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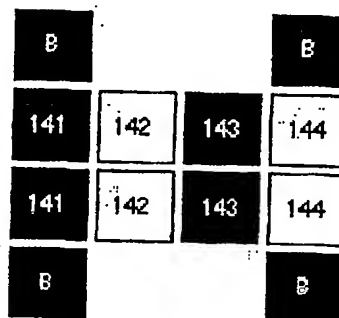
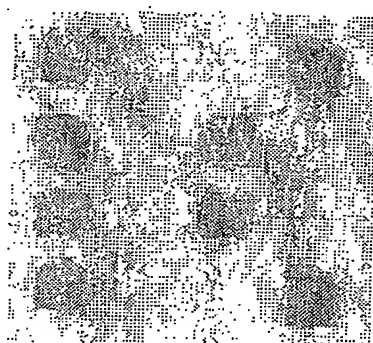
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**London SE1 2HW (GB)**(54) **KIT AND METHOD FOR DETERMINING HLA TYPE**

(57) HLA genotype of a test specimen is determined by hybridization of a nucleic acid sequence derived from the test specimen by using a substrate on which oligonucleotides of 10-24 nucleotide length derived from sequences of a group of genes belonging to HLA class I

or class II antigen on a human genome and including polymorphism of gene as alloantigens in the sequences are immobilized through covalent bonds. There are provided a typing kit and typing method that are suitable for processing of a large number of specimens and enable high accuracy typing by one test.

*Fig. 8*

## Description

### Technical Field

**[0001]** The present invention relates to a typing kit and typing method for determining HLA genotypes. HLA typing is carried out to judge possibility of transplantation between immunogenetically different individuals. Specifically, its purpose is to provide genetic information to determine transplantation compatibility for transplantation of an organ or tissue such as bone marrow, kidney, liver, pancreas, islets of Langerhans or cornea. The kit of the present invention can also be applied to susceptibility test for a specific disease that is caused by a hereditary factor, or individual identification.

**[0002]** The present invention further relates to PCR primers used for the aforementioned kit and method and a method for producing the same.

### Background Art

#### 1. Human leukocyte antigen (HLA) types and importance of histocompatibility

**[0003]** In autogenous transplantation or transplantation between immunogenetically homologous individuals such as identical twins of a tissue or cells, a graft is taken without inducing rejection reactions. On the other hand, in transplantation between immunogenetically different individuals such as other family members or unrelated individuals (allogenic transplantation) or transplantation between different species such as human being and other primates (interspecific transplantation), transplantation immunity is established and a rejection reaction is induced against a graft. There are antigens inducing particularly intense transplantation immunity as targets in this reaction, which are called major histocompatibility antigens. These antigens are controlled by a group of genes called MHC (Major Histocompatibility Complex). MHC is classified into classes I, II and III. class I and class II genes code for HLA (Human Leukocytic Antigen), which are transplantation antigens. HLA antigens are proteins responsible for discriminating self and non-self in the immune mechanism. Since a large number of alleles exist on their gene loci, the genes coding for these antigens are known to be highly polymorphic.

**[0004]** Determination of genotypes (typing) of HLA provides information for determination of the possibility of transplantation between immunogenetically different individuals. Specifically, this is employed for transplantation of an organ or tissue such as bone marrow, kidney, liver, pancreas, islets of Langerhans or cornea. The HLA genotypes are considered to be associated with certain refractory diseases and can also be utilized as supplementary means for diagnosing chronic rheumatoid arthritis, IDDM, insulin autoimmune syndrome and so forth. Besides, HLA typing is applied in a paternity test or individual identification because of the genetic polymorphism of HLA antigens.

#### 2. Genes involved in HLA typing and polymorphism

**[0005]** Human MHC is an HLA gene complex located on the short arm of the 6th chromosome. HLA antigens encoded by these genes include class I antigens controlled by HLA-A, -B, -C loci and class II antigens controlled by the HLA-D region (DR, DQ and DP).

**[0006]** class I antigens have a double-stranded structure composed of L-chain called  $\alpha 2$  microglobulin having a molecular weight of 12 kDa and H-chain having a molecular weight of 45 kDa. These antigens are involved in cellular immunity mediated by T cells, determine antigen specificity, and become target antigens in transplantation immunity. class II antigens have a double-stranded structure of two chains having molecular weights of 34 kDa and 29 kDa, respectively, determine antigen recognition and are involved in antigen presentation in humoral immunity. DP, DQ and DR in the HLA-D region are further subtyped according to polymorphism based on the amino acid or nucleotide sequence. DR is classified into about 20 subtypes, DQ is classified into about 10 subtypes, and DP is classified into a few subtypes. This large number of subtypes is attributed to the facts that the HLA antigens are composed of the  $\alpha$ -chain and the  $\beta$ -chain each having a different molecular weight and that only the  $\beta$ -chain serves as an alloantigenic determinant except for the DQ antigens. Moreover, the subtypes are further subdivided based on the amino acid sequences or the corresponding nucleotide sequences of the antigenic determinants.

#### 3. Means for HLA typing

**[0007]** Serological test utilizing antiserum reactions and cytological methods utilizing blast transformation of lymphocytes have been generally used. However, not only time and labor are required for examination and operation is complicated, but also accuracy of obtainable results are not so high. Therefore, DNA-based typing methods utilizing PCR are being developed to overcome these drawbacks and put into practical use. Examples thereof include the

PCR-SSP method (2), PCR-RFLP method (3), PCR-SSOP method (4), PCR-SSCP method (5) and so forth.

**[0008]** In the PCR-SSP method, a gene sequence is confirmed by amplifying the hypervariable region of target HLA antigen to determine the HLA antigen type. In this method, a large number of specific primers must be prepared to enable high accuracy typing and an enormous number of times of PCR also must be performed. Thus, this method is not necessarily practical.

**[0009]** In the PCR-RFLP (PCR-restriction fragment length polymorphism) method, a nucleotide sequence is amplified by PCR so as to contain a region involved in HLA antigen typing and the obtained amplification product is digested with restriction enzymes. The nucleotide sequence of the amplification product is digested by using restriction enzymes cleaving different sites depending on the HLA type and separated by electrophoresis. Then, the type is determined based on the migration pattern. This method is characterized in that results can be rapidly obtained. However, the cleavage sites of the restriction enzymes may not necessarily exist in the sequence. Further, the amplification product must be digested with multiple kinds of restriction enzymes for one typing. Thus, this method is not practical to process a large amount of specimen.

**[0010]** In the PCR-SSOP (PCR-sequence specific oligonucleotide probe) method, a nylon membrane on which DNA amplified by primers specific to HLA gene is immobilized is prepared and respective HLA type specific oligonucleotide probes are hybridized for typing. In a modified method of PCR-SSOP, a membrane on which respective HLA type specific oligonucleotides are immobilized is prepared and DNA amplified by using HLA gene specific primers are hybridized. In the method of immobilizing amplified DNA, a membrane must be prepared for a probe of each type for hybridization and therefore much labor is required for multiple specimen typing. Since the substrate on which amplified DNA or oligonucleotides are immobilized is a membrane, a membrane having a large area must be prepared to perform high accuracy typing with one membrane. Therefore, the typing pattern may be complicated.

**[0011]** In the PCR-SSCP (PCR-single strand conformation polymorphism) method, DNA amplified by PCR is denatured to obtain single strands and changes in the high-order structure due to the difference in nucleotide sequences are detected by electrophoresis. In this method, all DNA of known types must be electrophoresed on the same gel. Thus, practical multiple specimen processing is almost impossible.

#### 4. Importance of high accuracy HLA typing

**[0012]** To achieve ideal transplantation, it is important that HLA types of donor and recipient are compatible with high accuracy. Therefore, a tissue or individual information typed in high accuracy must be clarified in advance. In this respect, HLA antigens of the donor and the recipient must be compared with all the types currently discovered for determination before transplantation. Even if no donor having completely compatible HLA types is found, a high success rate can be expected by performing transplantation between individuals having similar types of which high accuracy HLA types are determined. Further, it is also expected that load of recipient can also be relieved in immune responses such as a rejection reaction occurring after transplantation.

**[0013]** When high accuracy typing is carried out in personal identification, one completely compatible individual is found out of tens or hundreds of thousands of individuals, but such an individual can be identified in high accuracy. Furthermore, if high accuracy typing is performed for each gene locus of HLA antigens, the accuracy of the personal identification can be further improved.

**[0014]** In a medical scene requiring HLA type information or a situation requiring a personal identification, provision of highly reliable HLA type information is being required. It is important that typing of a large number of specimens can be easily and conveniently performed by HLA typing methods therefor. Currently, various methods are being developed and improved, but there remain many drawbacks that operation is complicated, multiple specimen processing is not possible and so forth.

#### Disclosure of the Invention

**[0015]** To solve these problems, an object of the present invention is to provide a kit and method that are suitable for processing of a large number of specimens and enable a large number of high accuracy typing tests by one test for one specimen.

**[0016]** The present invention provides a typing kit for determining HLA genotype of a test specimen by hybridization between a nucleic acid sequence derived from the test specimen and oligonucleotides, which comprises a substrate on which the oligonucleotides are immobilized through covalent bonds, wherein the oligonucleotides are of 10-24 nucleotide length and are derived from sequences of a group of genes belonging to HLA class I or class II antigen on a human genome and each of the oligonucleotides includes polymorphism of each gene as alloantigen in the sequence.

**[0017]** The present invention also provides a method for determining HLA genotype of a test specimen, which comprises allowing hybridization of the oligonucleotides on the substrate of the aforementioned typing kit with a nucleic acid sequence derived from the specimen and detecting occurrence of hybridization of the oligonucleotides and the

nucleic acid sequence derived from the specimen.

**[0018]** The present invention also provides the aforementioned typing kit, wherein class I antigen is an antigen controlled by a gene locus coding for any of HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G or a null gene and class II antigen is an antigen controlled by a gene locus coding for any of HLA-DQ, HLA-DR or HLA-DP or a pseudogene;

**[0019]** The aforementioned typing kit, wherein HLA-DQ is an antigen derived from any of DQA1, DQA2, DQB1 and DQB2 gene loci or a pseudogene;

the aforementioned typing kit, wherein HLA-DR is an antigen derived from any of DRA, DRB1, DRB3, DRB4 and DRB5 gene loci or a pseudogene; and

the aforementioned typing kit, wherein HLA-DP is an antigen derived from any of DPA1, DPA2, DPB1 and DPB2 gene loci or a pseudogene.

**[0020]** The present invention also provides an oligonucleotide, which comprises a nucleotide sequence based on any of the aforementioned oligonucleotides of 10-24 nucleotide length comprising a nucleotide sequence specific to each type of HLA gene sequences on the human genome and obtained by extending or shortening one of the oligonucleotides at 5' or 3' end or at both ends, and in which the sequence specific to each HLA type is not substituted.

**[0021]** The present invention also provides the aforementioned typing kit, wherein at least one of the aforementioned oligonucleotides is replaced with an oligonucleotide of 8-24 nucleotide length obtained by extending or shortening any of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298 for a gene sequence on the genome at 5' or 3' end or at both ends without eliminating or changing nucleotides associated with the gene polymorphism to have optimized binding affinity for the aforementioned hybridization.

**[0022]** The present invention further provides the aforementioned typing kit, wherein at least one of the oligonucleotides is an oligonucleotide whose binding affinity for the hybridization is reduced by replacing an arbitrary nucleotide not involved in the gene polymorphism with a spacer compound, for example, a spacer compound having a nucleic acid frame that does not form a hydrogen bond with any nucleotide.

**[0023]** Furthermore, peptide nucleic acids (PNA) can be used instead of these oligonucleotides.

**[0024]** The present invention further provides a method for determining HLA genotype of a specimen, which comprises a step of carrying out low accuracy typing of HLA genotype of the specimen by performing first PCR amplification using primers for low accuracy genotyping and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with oligonucleotides contained in the aforementioned typing kit, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides; and

a step of carrying out high accuracy HLA genotyping of the specimen by performing second PCR amplification based on the above determination result using primers appropriately selected from primers for high accuracy genotyping and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the aforementioned typing kit, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides.

**[0025]** The present invention provides primers for low accuracy typing used for preparation of a probe for low accuracy typing, which consist of any oligonucleotide pair or an arbitrary combination of oligonucleotide pairs selected from a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 398 and 400 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 399 and 400 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 401 and 403 for amplifying DRB1; and

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 402 and 403 for amplifying DRB1.

**[0026]** The present invention further provides primers for high accuracy typing used for preparation of a probe for high accuracy typing based on result of low accuracy typing, which consist of any oligonucleotides pair or an arbitrary combination of oligonucleotides pairs selected from:

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 404 and 405 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 404 and 406 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 407 and 409 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 408 and 409 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 410 and 412 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 411 and 412 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 413 and 417 for amplifying DRB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 414 and 417 for amplifying DRB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 415 and 417 for amplifying DRB1; and

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 416 and 417 for amplifying DRB1.



**[0027]** The present invention further provides primers for high accuracy typing used for preparation of a probe for high accuracy typing, which consist of any oligonucleotide pair or an arbitrary combination of oligonucleotides pair selected from:

5 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 418 and 420 for amplifying DQA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 419 and 420 for amplifying DQA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 421 and 422 for amplifying DQB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 423 and 424 for amplifying DRA1;  
 10 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 425 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 426 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 427 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 429 and 431 for amplifying DRB3;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 430 and 431 for amplifying DRB3;  
 15 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 432 and 433 for amplifying DRB4;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 434 and 435 for amplifying DRB4;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 436 and 437 for amplifying DRB5;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 438 and 439 for amplifying DRB6;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 438 and 440 for amplifying DRB6;  
 20 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 441 and 442 for amplifying DRB7;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 443 and 444 for amplifying DPA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 445 and 446 for amplifying DPB1; and  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 445 and 447 for amplifying DPB1.

**[0028]** The term "class" used for HLA classes I and II in the present specification means classification based on the roles played in an organism. That is, the present specification is also according to this classification. class I antigen is a generic designation of HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G antigens. class II antigen is a generic designation of HLA-DQ, HLA-DR and HLA-DP antigens. Alloantigens are antigens characterizing individuals that belong to the same animal species but have genetic differences. Genetic differences mean differences in nucleotide sequences. Further, each of alloantigens classified based on genetic differences is designated as an alloantigen type.

**[0029]** In the present specification, the term "polymorphism" means a characteristic of having the same function but a different primary structure in a protein or DNA coding therefor.

**[0030]** In the present specification, the term "gene locus" means a position occupied by each HLA gene having polymorphism on a chromosome. As for gene loci of DR, DQ and DP antigens, gene loci of the DR antigens include DRA, DRB1, DRB3, DRB4 and DRB5, gene loci of the DQ antigens include DQA1, DQA2, DQB1 and DQB2, and gene loci of the DP antigens include DPA1, DPA2, DPB1 and DPB2.

**[0031]** In the present specification, the term "antigen derived from a gene locus" means an antigen translated from a gene present on the gene locus.

**[0032]** In the present specification, the term "nucleotides involved in gene polymorphism" means nucleotides having different primary sequences in genes coding for each alloantigen.

**[0033]** In the present specification, the term "test specimen" means a sample to be typed. In the present specification, it means chromosome DNA or RNA extracted from a tissue or somatic cell or a reactant enzymatically produced by using any of these as a template.

**[0034]** In the present specification, the term "homopolymer of thymidine residue" means a polymer obtained by repeatedly synthesizing deoxythymidine at 5' or 3' end of nucleotide sequence portion involved in typing. This synthesis of oligonucleotide can be performed by a commercially available DNA synthesizer.

**[0035]** Hereafter, a constitution of the kit of the present invention and a method of manufacturing the same, HLA typing method using the kit of the present invention, oligonucleotides for use in these kit and methods, a nucleic acid target derived from a test specimen human genome, which is a sample for use in the HLA typing using the kit of the present invention, and a method of manufacturing the same and primers for preparing the nucleic acid target will be explained.

<1> Synthetic oligonucleotide for use in the present invention

**[0036]** The synthetic oligonucleotides for use in the present invention are derived from human genomic genes involved in HLA typing and synthesized based on nucleotide sequences obtained from these genes. Hereafter, these oligonucleotides are also referred to as capture oligos.

**[0037]** Capture oligos are designed so that they should contain a type-specific nucleotide sequence region present in HLA gene of each type. The essential characteristic of the present invention is that the HLA typing is performed by

identifying whether a test human genome has these regions.

**[0038]** Typing of a type-specific nucleotide sequence in genes involved in HLA typing can be carried out by allowing hybridization of each type-specific capture oligo with a nucleic acid fragment target (also referred to as "nucleic acid target") having a part of nucleotide sequence of the genes involved in HLA typing of human chromosome DNA and determining with which capture oligo the fragment hybridizes.

**[0039]** The capture oligos can be prepared as synthetic oligonucleotides having a nucleotide sequence consisting of 10-24 nucleotides containing a nucleotide sequence specific to each type in a nucleotide sequence of gene involved in HLA typing. It is generally preferred that the capture oligos are designed so that the type-specific nucleotide sequence should be positioned in the center portions of the capture oligos. If the capture oligos are too short, it becomes difficult to detect hybridization. On the other hand, if the capture oligo is too long, inhibition of hybridization by a type-specific sequence does not occur. Therefore, the range of 10-24 nucleotides is preferred. However, this optimization of the capture oligo length primarily depends on characteristics of the sequence (content of specific nucleotide and repetition of the same nucleotide), and it has been confirmed by experiments according to the present invention that even a short chain can be used so long as it shows good binding property. In the process of hybrid formation of a capture oligo and a target, if there is an obstruction in the secondary structure negatively affecting the hybridization, a spacer or a nucleotide forming no hydrogen bond with any nucleotide can be introduced into the oligonucleotide sequence to obviate the obstruction. Further, the obstruction in the secondary structures of the target and capture oligo can also be obviated by extending or shortening the gene sequence on genome corresponding to the capture oligo at 5' or 3' end or at both ends of the capture oligo so that a type-specific sequence portion should be included.

**[0040]** DNA is usually used as the capture oligos, but a peptide nucleic acid (PNA) may also be used. The hybrids of a nucleic acid derived from a test human genome with a peptide nucleic acid have a higher  $T_m$  (melting temperature) compared with those of oligonucleotides and therefore they are expected to provide stable hybridization signals. The peptide nucleic acids can be readily synthesized by using a common peptide synthesizer.

**[0041]** Examples of capture oligo nucleotide sequences are shown as SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1078 and 1080-1298. These capture oligos are designed based on nucleotide sequence data obtained from publications and the home page of the Japanese Society for Histocompatibility and Immunogenetics (<http://square.umin.ac.jp/JSIH/frame.html>) and cover the whole HLA types.

**[0042]** Typing of a specific HLA type can be carried out by appropriately selecting a capture oligo from them and using it in a test.

**[0043]** The capture oligo length is, in general, in a range of 14-22 nucleotides. From the viewpoint of hybridization, 16-17 nucleotides is a typical size. Besides the nucleotide sequences of SEQ ID NOS: 1-397, oligonucleotides having a nucleotide sequence obtained by extending or shortening any of the HLA type gene sequences at 5' or 3' end or at both ends of the nucleotide sequences can be used as a capture oligo.

**[0044]** The nucleotide sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1078 and 1080-1298 may also be extended at either 5' or 3' end and shortened at the other end, but the length of a capture oligo is in a range of 10-24 nucleotides in any case.

**[0045]** In the present invention, the designed capture oligos well reflect the results of studies and researches before the present application. However, when additional information about nucleotide sequences of novel HLA types is obtained thereafter, novel capture oligos will be designed based on the method described in the present specification and they will fall within the claimed scope of the present application.

**[0046]** Synthesis of oligonucleotides, preparation of chromosome DNA, hybridization and PCR can be performed by usual methods known to those skilled in the art (see Maniatis, T. et al., "Molecular Cloning, A Laboratory Manual, second edition", Cold Spring Harbor Laboratory Press (1989)). The oligonucleotides can also be synthesized by using a commercially available DNA synthesizer.

## <2> Preparation of substrate for use in present invention

**[0047]** Material of a substrate on which oligonucleotides are immobilized is not particularly limited so long as the oligonucleotides can be stably immobilized. For example, there can be mentioned glass, synthetic resins such as polycarbonates and plastics. The form of the substrate is not particularly limited, but there can be mentioned a form of plate or film. A uniform and flat surface is suitable as a surface of the substrate.

**[0048]** The oligonucleotides can be immobilized on a substrate by using a method employed in usual hybridization such as physical absorption, electric bond and molecular covalent bond. In the examples of the present specification, substrates coated with carbodiimide groups or isocyanate groups on the surface thereof (Japanese Patent Laid-Open (Kokai) No. 08-023975) were used. To prepare the substrates coated with a material having carbodiimide groups or isocyanate groups on the surface thereof, employed was a method in which the substrate surfaces were coated with a polymer compound containing carbodiimide groups or isocyanate groups and irradiated with ultraviolet ray so that oligonucleotides can be covalently bonded and immobilized thereon. This is because marked improvement of immo-

bilization efficiency was successfully attained by irradiating a substrate having carbodiimide groups or isocyanate groups on the surface thereof with ultraviolet ray. As a linker for binding carbodiimide group or isocyanate group and an oligonucleotide, a compound having an amino group or imino group highly reactive to the carbodiimide group or isocyanate group is used. In case of the imino group, carbodiimide group or isocyanate group can be bound by polymerizing thymine at either end of the capture oligo.

**[0049]** When oligonucleotides are spotted, if the amount of spotted oligonucleotides is too small, sufficient reactivity between the oligonucleotides and the nucleic acid target may not be ensured and therefore typing may become difficult. Further, high-density spotting invites technical problems as well as high cost. In addition, a more precise and expensive detecting device (typically, a scanner) is required for determination of occurrence of hybridization utilizing fluorescent labeling of the nucleic acid target, chemical color development or the like. Therefore, the oligonucleotides are preferably immobilized on the substrate surface in a diameter of 10-1,000  $\mu\text{m}$ . The oligonucleotides can be immobilized by spotting an oligonucleotide solution on a substrate by using, for example, a spotting machine. It is usually preferable that the oligonucleotide solution is spotted substantially in a circular shape.

**[0050]** Each oligonucleotide is spotted at a plurality of sites on one single substrate, and the spots are preferably arranged in a grid pattern. When the spot size is 1000  $\mu\text{m}$  in diameter, the total number of the spots is preferably 1600 or less per  $\text{cm}^2$ , and when such spots are spotted in a square shape, the square dimension is preferably 40 x 40 or less. When the spot size is 10  $\mu\text{m}$  in diameter, the total number of spots is preferably 400 or less per  $\text{cm}^2$ , and when such spots are spotted in a square shape, the square dimension is preferably 20 x 20 or less. If the longitudinal and transverse sizes are different, the numbers along longitudinal and transverse directions can be adjusted depending on the shape.

### <3> Arrangement of oligonucleotides on substrate

**[0051]** To facilitate typing of each HLA type, oligonucleotides are preferably arranged on a substrate so that oligonucleotides to be used for determining each HLA type should be placed in one partition, in a line, or the like. Oligonucleotides suitable for low accuracy genotyping and those suitable for high accuracy genotyping may be immobilized on the same substrate to simultaneously carry out low accuracy genotyping and high accuracy genotyping. To perform low accuracy genotyping and high accuracy genotyping stepwise, a substrate on which oligonucleotides suitable for low accuracy genotyping are immobilized and a substrate on which oligonucleotides suitable for high accuracy genotyping are immobilized may be separately prepared.

**[0052]** Alternatively, the typing may be performed by preparing alignment of gene sequence of each HLA, setting a nucleotide sequence in which at least two nucleotide polymorphisms or sequence polymorphisms involving the HLA typing are observed in a nucleotide sequence consisting of 1-10 nucleotides as a patchwork segment, and finding the patchworks in gene sequences of all of the HLA genes and, performing typing by combination of the patchworks. To perform advanced typing, the typing may be performed by setting a nucleotide sequence in which at least one nucleotide polymorphism or sequence polymorphism are observed in a nucleotide sequence consisting of 1-10 nucleotides based on the alignment of the nucleotide sequences of HLA genes as a satellite segment, and finding the satellites in gene sequences of all of the HLA genes and, performing typing by combination of the satellites, whereby a type which cannot be discriminated by the patchworks may be discriminated. Typing using patchworks and satellites may make it possible to judge whether each of HLA typing of the test specimen is homozygote or heterozygote and determine the types of HLA simultaneously. The oligonucleotides may be prepared to be allocated so that the HLA types are determined by developing progressively the patchworks and satellites in a test specimen.

**[0053]** Spots on the substrate are usually arranged within an area of 1  $\text{cm}^2$ . Figs. 1-7 and 11-17 show examples of preferred positions of oligonucleotides immobilized on the substrate. One square in the figure represents a spot of each oligonucleotide. The indicated numbers represent sequence numbers of the oligonucleotides.

### <4> Preparation of nucleic acid from test sample and preparation of nucleic acid probe

**[0054]** Nucleic acid can be prepared from a test sample by the same way as a usual method of preparing nucleic acids from animal cells. For example, DNA can be prepared by a method described in Maniatis, T. et al., "Molecular Cloning, A Laboratory Manual, second edition", Cold Spring Harbor Laboratory Press (1989). DNA can also be extracted from cells obtained by culture in a similar manner. This method is a standard test method, but there are many alternative methods and any of these methods may be employed.

**[0055]** A nucleic acid target for use in HLA typing is prepared by using the obtained DNA. The nucleic acid target can be prepared by amplifying a nucleic acid by using primers designed so as to correspond to a nucleotide sequence of capture oligo. While DNA is usually used as the nucleic acid target, RNA may also be used. As a nucleic acid amplification method, there can be mentioned, for example, a method of amplifying the nucleic acid as DNA by PCR (polymerize chain reaction) or as RNA by in vitro transcription.

**[0056]** Primers used for PCR are designed so that a nucleic acid target should include a complementary nucleotide sequence of a capture oligo except for a sequence region specific to each HLA type. A nucleic acid target may be longer or shorter than a capture oligo, so long as it is capable of hybridization. To increase specificity of amplification reactions, initial amplification may be carried out by using preliminary primers for amplifying a region larger than the target nucleic acid probe and then nucleic acid amplification may be carried out by using the amplified DNA as a template and primers for obtaining the target nucleic acid probe.

**[0057]** There may be a plurality of type-specific nucleotide sequence regions involved in typing depending on HLA types. In such a case, nucleic acid targets corresponding to each specific region can be prepared.

**[0058]** Furthermore, typing of DQB and DRB is carried out by selecting primers for high accuracy typing based on results obtained by using a nucleic acid sequence amplified by primers for low accuracy typing and then carrying out high accuracy typing, or allowing hybridization of nucleic acid sequences amplified by using all of the low accuracy primers for DQB and DRB and nucleic acid sequences amplified by using all of the high accuracy primers for DQB and DRB in separate blocks on which different captures are immobilized and determining low accuracy or high accuracy type from the obtained respective results. For typing of DQA, DRA, DPA and DPB, high accuracy typing is performed by using nucleic acid sequences amplified by using primers for high accuracy typing.

**[0059]** If a primer for use in final nucleic acid amplification is labeled in advance, a labeled nucleic acid target can be obtained. The nucleic acid target may be labeled during or after nucleic acid amplification. As the label, those labeling substances similar to those for a probe for use in usual hybridization, such as fluorescent substances or haptens, can be used. Specifically, as the fluorescent substances, there can be mentioned, for example, fluoresceine (FITC), rhodamine, phycoerythrin (PE), Texas Red, cyanine fluorescent dyes and so forth. As the haptens, there can be mentioned biotin, digoxigenin (Dig), dinitrophenyl (DNP) and so forth.

**[0060]** Primers for preparing a nucleic acid target can be included in an HLA typing kit together with a substrate on which oligonucleotides are immobilized.

#### <5> Hybridization of oligonucleotides on substrate and nucleic acid target

**[0061]** Hybridization can be performed in the same way as usual nucleic acid hybridization. A specific procedure will be exemplified below.

**[0062]** A nucleic acid target is added to a fusion solution comprising a salt solution such as standard saline citrate (SSC), a blocking solution such as sodium dodecyl sulfate (SDS) or bovine serum albumin (BSA) and an additive for promoting fusion reactions. When the target is double-stranded, denaturation is performed by heating or the like. After a few  $\mu$ L of a nucleic acid target solution is added onto a substrate, heat treatment is performed for a few hours (usually at 37-70°C) so that a hybrid should be formed between an oligonucleotide immobilized on the substrate and the nucleic acid target.

**[0063]** 5 x SSC or 3 M tetramethylammonium chloride is added onto the substrate and heated (usually at 37-50°C). Then, nonspecific nucleic acids that do not form hybrids are removed from the substrate and only specific hybrids are selectively maintained on the substrate.

**[0064]** To detect a hybrid, a fluorescent substance or hapten introduced into the nucleic acid target is used. When a hapten is used, a solution containing a conjugate of a protein recognizing the hapten or a protein that binds to the hapten and alkaline phosphatase, horseradish peroxidase or the like (enzyme conjugate) is added onto the substrate and allowed to react at room temperature for several tens of minutes. A nonspecific adsorption reaction of the enzyme conjugate and the substrate can be prevented by completely coating regions on the substrate other than the regions on which oligonucleotides are immobilized with a protein such as casein before this binding reaction of the hapten and the enzyme conjugate is performed. This treatment can be carried out by, after the oligonucleotides are immobilized, adding a solution of a protein such as casein onto the substrate and leaving it at room temperature for a several tens of minutes.

**[0065]** After the binding reaction of the enzyme conjugate and the hapten of the nucleic acid target is completed, the substrate is washed with an appropriate buffer containing a surfactant to remove enzyme conjugates that have not bound to the hapten. Thus, only enzyme conjugates bound to the hapten in the nucleic acid target should remain on the substrate.

**[0066]** To visualize the hybrid, a compound that becomes insoluble only in the presence of a hapten and an enzyme conjugate is added. The generation of such an insoluble compound is amplified by enzymatic reaction, and hence the hybrid is visualized. As the compound used for this purpose, when the enzyme in the enzyme conjugate is alkaline phosphatase, there can be used nitroblue tetrazolium chloride (NBT) and 5-bromo-4-chloro-3-indolylphosphate p-toluidine salt (BCIP). When the enzyme is horseradish peroxidase, 3,3',5,5'-tetramethylbenzidine (TMB) or the like can be used.

**[0067]** HLA typing based on the obtained results of hybridization is carried out by observing pigmentation or fluorescence at positions where capture oligos are immobilized. That is, the positions showing pigmentation or fluorescence

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indicate a corresponding gene. When all of oligonucleotides belonging to each type show color development, the type is determined. For example, in Figs. 8-10 referred to in the examples, hybridization signals were obtained only for oligonucleotides of SEQ ID NOS: 141 and 143 out of SEQ ID NOS: 141-144, and thus the test specimen is typed as DRA\*0101. Correspondence of hybridization signals obtained at positions of capture oligos of SEQ ID NOS: 1-397 and HLA types are summarized in Tables 1-20.

Table 1.

Correspondence of DQA1 types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DQA1*0101	1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53
DQA1*01021	1,4,7,10,12,14,16,22,24,27,31,35,39,42,47,51,53
DQA1*01022	1,4,7,10,12,14,16,20,22,24,27,31,35,39,42,47,51,53
DQA1*0103	2,4,7,10,15,20,22,26,27,31,35,39,42,47,51,53
DQA1*0104	1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53
DQA1*0105	1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53
DQA1*0201	1,5,8,10,15,19,23,24,28,32,37,39,42,47,52,53
DQA1*03011	2,5,9,13,17,19,23,24,29,33,37,41,43,48,49,52,53
DQA1*0302	2,5,9,13,17,19,23,24,29,33,36,41,43,49,52,53
DQA1*0303	1,5,9,12,17,19,23,24,29,33,36,41,43,49,52,53
DQA1*0401	2,6,8,10,12,14,16,21,22,25,30,34,38,41,44,48,52,54
DQA1*05011	3,6,8,10,12,14,16,21,22,25,30,34,38,41,45,50,52,53
DQA1*05012	1,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53
DQA1*05013	3,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53
DQA1*0502	8,10,12,14,16,20,22,25,30,34,38,40,45,50,52,53
DQA1*0503	3,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53
DQA1*0504	3,6,8,11,14,16,20,22,25,30,34,38,41,45,50,52,53
DQA1*06011	2,6,8,10,15,21,22,25,30,34,38,41,46,48,52,53
DQA1*06012	8,10,15,21,22,25,30,34,38,41,46,48,52,53

Table 2.

Correspondence of DQB types and low accuracy typing capture oligos	
Type	Corresponding capture oligos
DQB1*0501	56
DQB1*0502	56
DQB1*05031	56
DQB1*06011	55
DQB1*06013	55
DQB1*0602	55
DQB1*0603	55
DQB1*0604	56
DQB1*06051	56
DQB1*0609	56

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Table 2. (continued)

Correspondence of DQB types and low accuracy typing capture oligos	
Type	Corresponding capture oligos
DQB1*0610	55
DQB1*0611	55
DQB1*0612	56
DQB1*0614	55
DQB1*0201	57, 58
DQB1*0202	57, 58
DQB1*0203	57, 58
DQB1*03011	57
DQB1*03012	57
DQB1*0302	57
DQB1*03032	57
DQB1*0304	57
DQB1*0305	57
DQB1*0306	57
DQB1*0307	57
DQB1*0308	57
DQB1*0401	57

Table 3.

Correspondence of DQB types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DQB1*0501	62,65,68,70,74,79,82,86,89,92,97,99,103,114,116,118,126,131,137,138
DQB1*0502	62,65,68,70,74,79,82,86,89,93,97,99,104,114,116,118,126,130,137,138
DQB1*05031	62,65,68,70,74,79,82,86,94,97,99,106,114,116,118,126,130,137,138
DQB1*05032	74,79,82,86,94,97,99,105,114,116
DQB1*0504	65,68,70,74,80,83,86,89,93,97,99,104,114,117,119,126,131
DQB1*06011	63,66,69,75,80,84,94,97,99,106,114,117,120,124,127,132,135,139
DQB1*06012	66,68,70,75,80,84,94,98,99,106,114,117,120,124,127,132,135,139
DQB1*06013	63,66,69,75,80,84,94,97,99,106,114,117,120,124,127,132,135,139
DQB1*0602	64,67,68,70,76,80,87,89,95,97,99,105,114,116,121,125,127,132,135,139
DQB1*0603	62,67,68,70,77,79,87,89,95,97,99,105,114,116,121,125,127,132,135,139
DQB1*0604	62,67,68,70,77,79,87,89,93,97,99,103,114,116,122,125,127,132,134,138
DQB1*06051	62,65,68,70,77,80,87,89,93,97,99,103,114,116,122,125,127,132,134,138
DQB1*06052	77,80,87,89,93,97,99,107,114,116,122,125,127,132
DQB1*0606	77,80,87,89,93,97,99,103,114,116,122,128,129,131
DQB1*0607	67,68,70,77,79,87,89,95,97,99,105,114,116,122,125,127,132
DQB1*0608	67,68,70,77,79,87,89,95,97,99,103,114,116,121,127,132

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Table 3. (continued)

Correspondence of DQB types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DQB1*0609	62,67,68,70,77,80,87,89,93,97,99,103,114,116,122,125,127,132,134,138
DQB1*0610	64,67,68,70,76,80,87,89,95,97,99,104,114,116,121,125,127,132,135,139
DQB1*0611	67,68,70,76,80,87,89,95,97,99, 105,114,116,121,125,127,132,135,139
DQB1*0612	62,67,68,70,77,80,87,89,93,97,99,103,114,116,121,125,127,132,134,138
DQB1*0613	64,67,68,70,76,80,87,89,95,97,99,103,114,116,121,125,127,132,135
DQB1*0614	67,68,70,77,79,87,89,95,97,99, 105,114,116,121,125,127,132,135,139
DQB1*0201	60,61,62,67,71,78,81,85,90,100,108,114,116,123,128,129,131,136,140
DQB1*0202	59,60,61,62,67,71,78,81,85,90,100,108,114,117,123,128,129,131,136,140
DQB1*0203	62,67,71,78,81,85,90,100,109,114,116,117,123,128,129,131,136,140
DQB1*03011	62,66,68,70,75,80,88,91,93,101,110,114,116,122,125,127,132,136,140
DQB1*03012	66,68,70,75,80,87,91,93,101,110,114,116,122,125,127,132,136,140
DQB1*0302	62,67,68,70,76,80,88,94,101,111,114,116,122,125,127,132,136,140
DQB1*03032	62,67,68,70,76,80,88,94,101,110,114,116,122,125,127,132,136,140
DQB1*0304	62,66,68,70,75,80,88,91,93,101,111,114,116,122,125,127,132,136,140
DQB1*0305	62,67,72,74,80,87,94,101,111,114,116,122,125,127,132,136,140
DQB1*0306	62,67,68,70,76,80,88,94,101,110,115,117,119,126,133,136,140
DQB1*0307	62,67,68,70,76,80,88,96,101,111,114,116,122,125,127,132,136,140
DQB1*0308	62,67,68,70,76,80,88,94,101,111,114,116,121,125,127,132,136,140
DQB1*0401	64,67,73,74,80,87,94,102,112,113,115,117,119,126,133,136,140
DQB1*0402	64,67,72,74,80,87,94,102,112,113,115,117,119,126,133,136,140

Table 4.

Correspondence of DRA types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DRA*0101	141,143
DRA*0102	142,144

Table 5.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (1), alleles whose serological antigen type is DR1		
Type	Corresponding capture oligos	
	low accuracy	High accuracy
DRB1*0101	145	166, 173, 187, 213, 246, 250
DRB1*01021	145	166, 173, 187, 213, 232, 236, 250
DRB1*01022	145	166, 173, 187, 213, 228, 232, 236, 250
DRB1*0103	145	166, 173, 187, 211, 215, 246, 250
DRB1*0104	145	173, 187, 213, 230, 250

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Table 5. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (1), alleles whose serological antigen type is DR1		
Type	Corresponding capture oligos	
	low accuracy	High accuracy
DRB1*0105	145	173, 187, 192, 213, 246, 250
DRB1*0106	145	

Table 6.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (2), alleles whose serological antigen type is DR2		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*15011	149	157,187,194,201,211 ,212, 234, 247
DRB1*15012	149	157,187,194,201,211,212,233,247
DRB1*15021	149	157,18,7194,201,211 ,212, 246, 247
DRB1*15022		187, 194, 211 ,212, 247, 250
DRB1*15023	149	157,181,187,194,201,211, 212
DRB1*1503	149	157,178,187,194,201,211, 212, 234, 247
DRB1*1504	149	157, 187, 194, 201, 210, 212, 234, 247
DRB1*1505	149	157, 187, 194, 201, 212, 234, 247
DRB1*1506	149	187, 194, 196 201, 211 ,212, 247
DRB1*1507	149	157, 187, 201, 211, 212, 247
DRB1*1508	149	157, 187, 194 201 212, 246, 247
DRB1*1509	149	
DRB1*1510	149	
DRB1*16011	149	157, 187 201, 210 220, 246, 247
DRB1*16012	149	157, 187, 20, 210, 246, 247
DRB1*16021	149	157, 187, 201, 220, 246, 247
DRB1*16022	149	187, 201, 247
DRB1*1603	149	157, 187 201, 210 ,221, 246, 247
DRB1*1604	149	187, 201, 210, 222, 247
DRB1*1605	149	187, 201, 211, 220, 247
DRB1*1607	149	157, 187, 201, 211, 220, 241, 246, 247
DRB1*1608	149	157, 184 201, 210, 220, 246, 247



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Table 7.

Correspondence of DRB1 Types and low accuracy and high accuracy typing capture oligos (3), alleles whose serological antigen type is DR3		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*03011	146	171, 179, 184, 194, 216, 226, 229, 234, 229, 234, 248, 250
DRB1*03012	146	171, 179, 184, 194, 216, 226, 230, 234, 230, 234, 248, 250
DRB1*03021	146	174, 184, 216, 226, 229, 246, 248, 250
DRB1*03022	146	174, 184, 216, 226, 230, 246, 248, 250
DRB1*0303	146	174, 184, 216, 226, 229, 234, 248, 250
DRB1*0304	146	171, 179, 187, 194, 216, 226, 229, 248, 250
DRB1*0305	146	171, 179, 184, 194, 216, 226, 229, 246, 248, 250
DRB1*0306	146	171, 179, 184, 216, 229, 234, 248, 250
DRB1*0307	146	179, 184, 194, 216, 226, 229, 234, 248, 250
DRB1*0308	146	171, 179, 184, 194, 206, 216, 226, 229, 234, 248
DRB1*0309	146	171, 182, 184, 194, 216, 226, 229, 246, 250
DRB1*0310	146	171, 179, 184, 194, 200, 216, 226, 229, 234, 244, 248
DRB1*0311	146	171, 179, 184, 194, 216, 227, 229, 234, 248, 250
DRB1*0312	146	171, 179, 184, 194, 199, 216, 226, 229, 248
DRB1*0313	146	
DRB1*0314	146	
DRB1*0315	146	
DRB1*0316	146	
DRB1*0317	146	

Table 8.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (4), alleles whose serological antigen type is DR4		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*04011	147	160, 169, 180, 216, 246, 249, 250
DRB1*04012	147	160, 169, 183, 216, 246, 249, 250
DRB1*0402	147	160, 169, 180, 211, 215, 234, 249, 250
DRB1*0403		160, 169, 180, 213, 223, 234, 249, 250
DRB1*04031	147	
DRB1*04032	147	161, 169, 180, 201, 213, 223, 234, 249
DRB1*0404	147	160, 169, 180, 213, 234, 249, 250
DRB1*04051	147	160, 169, 180, 199, 213, 246, 249
DRB1*04052	147	160, 169, 180, 193, 199, 213, 246
DRB1*0406	147	160, 169, 180, 187, 213, 223, 234, 250

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Table 8. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (4), alleles whose serological antigen type is DR4		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*0407	147	160, 169, 180, 213, 223, 246, 249, 250
DRB1*0408	147	160, 169, 180, 213, 246, 249, 250
DRB1*0409		169, 180, 199, 216, 249
DRB1*0410	147	160, 169, 180, 199, 213, 234, 249
DRB1*0411	147	160, 169, 180, 199, 213, 223, 234, 249
DRB1*0412	147	160, 169, 199, 211, 222, 234, 249
DRB1*0413		169, 180, 216, 234, 249, 250
DRB1*0414		169, 180, 211, 215, 249, 250
DRB1*0415	147	160, 169, 180, 206, 210, 249
DRB1*0416		169, 180, 207, 216, 249
DRB1*0417		169, 180, 199, 213, 223, 249
DRB1*0418		180, 211, 222, 234, 249, 250
DRB1*0419		169, 180, 187, 213, 246, 250
DRB1*0420		169, 180, 187, 213, 223, 250
DRB1*0421	147	160, 169, 180, 187, 216, 246, 250
DRB1*0422	147	160, 169, 180, 216, 226, 229, 234, 249, 250
DRB1*0423	147	160, 169, 180, 213, 245, 249, 250
DRB1*0424	147	160, 169, 180, 199, 214, 246, 249
DRB1*0425	147	160, 169, 180, 210, 222, 249, 250
DRB1*0426	147	160, 169, 180, 209, 216, 249
DRB1*0427	147	160, 169, 118, 213, 223, 236, 249, 250
DRB1*0428	147	160, 169, 180, 194, 199, 213, 246, 249
DRB1*0429	147	160, 169, 180, 197, 199, 213, 246, 249
DRB1*0430	147	160, 169, 180, 195, 213, 246, 249
DRB1*0431	147	160, 169, 180, 213, 222, 246, 249, 250
DRB1*0432	147	160, 169, 180, 219, 249, 250
DRB1*0433	147	
DRB1*0434	147	

Table 9.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (5), alleles whose serological antigen type is DR5 and whose subtype is DR11		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*11011	146	194, 206, 210, 246, 249

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Table 9. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (5), alleles whose serological antigen type is DR5 and whose subtype is DR11		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*11012	146	194, 206, 210, 239, 246, 249
DRB1*11013	146	194, 206, 210, 220, 246, 249
DRB1*1102	146	194, 206, 211, 215, 234, 249
DRB1*1103	146	194, 206, 210, 220, 246, 249
DRB1*11041	146	194, 206, 210, 234, 249
DRB1*11042	146	194, 206, 210, 234, 239, 249
DRB1*1105	146	194, 206, 210, 246, 249
DRB1*1106	146	194, 206, 210, 236, 249
DRB1*1107	146	194, 206, 216, 226, 229, 234, 249
DRB1*11081		194, 206, 246, 249
DRB1*11082		194, 206, 246, 249
DRB1*1109		179, 184, 194, 206, 210, 246, 248
DRB1*1110		179, 188, 194, 206, 210, 248
DRB1*1111		194, 206, 210, 215, 246, 249
DRB1*1112		188, 194, 206, 210
DRB1*1113	146	179, 188, 194, 206, 214, 232, 234, 248
DRB1*1114	146	194, 206, 211, 215, 246, 249
DRB1*1115	146	186, 194, 206, 210, 246
DRB1*1116	146	179, 184, 194, 206, 211, 215, 248
DRB1*1117	146	179, 188, 206, 214, 223, 232, 234, 248
DRB1*1118	146	194, 206, 211, 234, 249
DRB1*1119	146	194, 206, 211, 246, 249
DRB1*1120	146	179, 184, 194, 206, 211, 215, 246, 248
DRB1*1121	146	194, 206, 211, 215, 249
DRB1*1122	147	162, 194, 206, 210, 246, 247, 249
DRB1*1123	146	194, 206, 210, 222, 249
DRB1*1124	146	185, 194, 206, 210
DRB1*1125	146	194, 206, 210, 222, 234, 249
DRB1*1126	146	194, 206, 213, 234, 249
DRB1*1127		194, 206, 210, 230, 249
DRB1*11271	146	
DRB1*11272	146	
DRB1*1128	146	184, 194, 206
DRB1*1129	146	187, 194, 206, 210, 246
DRB1*1130	154	165, 194, 206, 210, 246, 249

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Table 9. (continued)

Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1131	146	194, 208, 211, 246, 249
DRB1*1132	146	194, 206, 210, 224, 246, 249
DRB1*1133	146	194, 210, 242, 246, 249, 250
DRB1*1134	146	194, 206, 213, 234, 249
DRB1*1135	146	194, 210, 234, 242, 249, 250
DRB1*1136	146	
DRB1*1137	146	

Table 10.

Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1201	146	158, 172, 191, 194, 202, 211, 220, 232, 236, 248
DRB1*12021	146	158, 172, 191, 194, 202, 210, 220, 232, 246, 248
DRB1*12022	146	158, 172, 191, 194, 202, 210, 220, 248
DRB1*12032	146	158, 172, 191, 194, 202, 211, 220, 234, 248
DRB1*1204	146	158, 172, 191, 194, 206, 211, 220, 232, 248
DRB1*1205	146	158, 172, 190, 194, 202, 211, 220, 232, 236, 248
DRB1*1206	146	

Table 11.

Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1301	146	179, 184, 194, 211, 215, 234, 248, 250
DRB1*1302		179, 184, 194, 211, 215, 246, 248, 250
DRB1*13021	146	
DRB1*13022	146	
DRB1*12031	146	199, 211, 218, 239, 246, 249
DRB1*13032		199, 211, 218, 239, 246, 249
DRB1*13032	146	
DRB1*1304	146	194, 199, 211, 215, 234, 249
DRB1*1305	146	179, 184, 194, 210, 246, 248, 250

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Table 11. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (7), alleles whose serological antigen type is DR6 and whose subtype is DR13		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1306	146	179, 184, 194, 211, 234, 248, 250
DRB1*13071	146	210, 246, 249, 250
DRB1*13072	146	201, 210, 246, 249
DRB1*1308	146	179, 188, 211, 215, 234, 248, 250
DRB1*1309	146	179,184,194,211, 212, 234, 248, 250
DRB1*1310	146	179, 184, 194, 211, 218, 234, 248,250
DRB1*1311	146	194, 210, 249, 250
DRB1*1312	146	199, 211, 246, 249
DRB1*1313	146	199, 211, 222, 246, 249
DRB1*1314		194, 210, 246, 249, 250
DRB1*13142	146	
DRB1*1315	146	174, 184, 194, 211, 215, 234, 248, 250
DRB1*1316	146	179, 184, 194, 211, 215, 235, 248, 250
DRB1*1317	146	158, 194, 211, 215, 234, 249, 250
DRB1*1318	146	179, 184, 194, 210, 222, 234, 248, 250
DRB1*1319	146	174, 188, 211, 215, 222, 234, 248, 250
DRB1*1320	146	179, 184, 194, 215, 234, 248, 250
DRB1*1321	146	194, 199, 210, 246, 249
DRB1*1322	146	194, 211, 215, 234, 249, 250
DRB1*1323	146	194, 211, 215, 239, 246, 249, 250
DRB1*1324	146	194, 210, 215, 234, 249, 250
DRB1*1325	146	194, 249, 250
DRB1*1326	146	174, 184, 201, 210, 220, 248
DRB1*1327	146	171, 179, 184, 194, 211, 215, 220, 234, 248, 250
DRB1*1328	146	179, 184, 194, 211 215, 237, 248, 250
DRB1*1329	146	179, 184, 194, 215, 246, 248, 250
DRB1*1330	146	194, 199 211, 246, 249
DRB1*1331	146	179, 184 194 211 215, 246, 248, 250
DRB1*1332	146	179, 184, 199, 211, 215, 234, 248
DRB1*1333	146	199, 211, 218, 225, 229, 249
DRB1*1334	146	179, 189, 194 ,211, 215, 240, 246, 248, 250
DRB1*1335	146	
DRB1*1336	146	
DRB1*1337	146	
DRB1*1338	146	

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Table 11. (continued)

Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1339	146	
DRB1*1340	146	
DRB1*1341	146	

Table 12.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (8), alleles whose serological antigen type is DR6 and whose subtype is DR14		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1401	146	179, 188, 200, 214, 223, 232, 234, 244, 248
DRB1*1402	146	174, 184, 213, 246, 248, 250
DRB1*1403	146	174, 184, 222, 246, 248, 250
DRB1*1404	146	158, 179, 188, 200, 214, 223, 232, 234, 244, 248
DRB1*1405	146	159, 179, 188, 205, 214, 223, 232, 234, 248
DRB1*1406	146	174, 184, 213, 234, 248, 250
DRB1*1407	146	179, 188, 200, 214, 223, 232, 244, 248
DRB1*1408	146	179, 188, 203, 214, 223, 232, 234, 244, 248
DRB1*1409	146	179, 184, 213, 246, 248, 250
DRB1*1410	147	160, 179, 188, 200, 214, 223, 232, 234, 244, 248
DRB1*1411	146	158, 179, 188, 206, 214, 223, 232, 248
DRB1*1412		174, 184, 222, 248, 250
DRB1*1413	146	174, 184, 199, 213, 248
DRB1*1414	146	179, 188, 214, 223, 232, 246, 248, 250
DRB1*1415		158, 179, 188, 210, 222, 234, 248, 250
DRB1*1416	146	179, 188, 200, 211, 215, 234, 244, 248
DRB1*1417	146	179, 184, 194, 213, 234, 248, 250
DRB1*1418	146	174, 184, 205, 214, 223, 232, 234, 248
DRB1*1419	146	174, 184, 216, 246, 248, 250
DRB1*1420	146	174, 188, 213, 248, 250
DRB1*1421	146	179, 184, 194, 216, 248, 250
DRB1*1422	146	179, 188, 200, 210, 244, 246, 248
DRB1*1423	146	179, 188, 214, 223, 232, 234, 248, 250
DRB1*1424	146	174, 184, 211, 212, 246, 248, 250
DRB1*1425	146	200, 210, 244, 249
DRB1*1426	146	170, 179, 188, 200, 214, 223, 232, 234, 244, 248

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Table 12. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (8), alleles whose serological antigen type is DR6 and whose subtype is DR14		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*1427	146	174, 184 210, 222, 246, 248, 250
DRB1*1428	146	158, 179, 188, 200, 214, 223, 232, 244, 248
DRB1*1429	146	174, 184, 213, 236, 248, 250
DRB1*1430	146	179, 184 194, 213, 246, 248, 250
DRB1*1431	146	158, 179, 188, 200, 214, 232, 234, 244, 2480
DRB1*1432	146	
DRB1*1433	146	179, 184, 194, 213, 223, 234, 248, 250
DRB1*1434	146	
DRB1*1435	146	
DRB1*1436	146	

Table 13.

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (9), alleles whose serological antigen type is DR7, DR8, DR9 or DR10		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*0701		164, 169, 170, 176, 188, 198, 202, 211, 217, 227, 231, 246, 247
DRB1*07011	148	
DRB1*07012	148	
DRB1*0703	148	164, 169, 170, 177, 188, 198, 202, 211, 217, 227, 231, 247
DRB1*0704	148	164, 169, 170, 176, 188, 198, 202, 211, 217, 227, 230, 247
DRB1*0801	146	158, 199, 210, 222, 239, 246, 249
DRB1*08021	146	158, 210, 222, 246, 249, 250
DRB1*08022	146	158, 210, 222, 246, 249, 250
DRB1*08032	146	158, 199, 211, 222, 246, 249
DRB1*08041	146	158, 210, 222, 234, 249, 250
DRB1*08042		158, 210, 222, 238, 239, 249, 250
DRB1*08043	146	158, 210, 222, 238, 239, 249, 250
DRB1*0805	146	158, 199, 210, 249
DRB1*0806	146	158, 199, 210, 222, 234, 249
DRB1*0807	146	158, 210, 222, 239, 246, 249, 250
DRB1*0808	146	158, 200, 210, 222, 244, 249
DRB1*0809		168, 179, 188, 210, 222, 239, 246, 248, 250
DRB1*0810	146	158, 199, 211, 222, 234, 249

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Table 13. (continued)

Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (9), alleles whose serological antigen type is DR7, DR8, DR9 or DR10		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB1*0811	146	158, 210, 222, 239, 246, 249, 250
DRB1*0812	146	158, 199, 211, 222, 249
DRB1*0813	146	158, 222, 249, 250
DRB1*0814	146	167, 199, 211 222, 2467, 249
DRB1*0815	146	158203211222, 244, 246, 249
DRB1*0816	146	158,185,199,210,222
DRB1*0817	146	158, 194, 199, 210, 222, 249
DRB1*0818	146	158, 199, 211, 246, 249
DRB1*0819	146	58, 211 222, 246, 249, 250
DRB1*0820	146	
DRB1*0821	146	168, 179, 188, 210, 222, 239, 246, 248, 250
DRB1*09012	150	163, 169, 175, 184, 202, 210, 214, 223, 231, 243
DRB1*10011	151	
DRB1*10012	151	

Table 14.

Correspondence of DRB3 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	High accuracy
DRB3*01011	152	252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*01012	152	252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*01013	152	252, 255, 258, 260, 265, 268, 271, 273, 275, 277, 279
DRB3*01014	152	252, 255, 258, 260, 265, 267, 271, 273, 275, 278, 279
DRB3*0102	153	253, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*0103	152	252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*0104	152	252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*0105	152	252, 256, 258, 260, 265, 267, 271, 273, 275, 277, 279
DRB3*0106	152	252, 255, 258, 261, 265, 267, 271, 273, 275, 277, 279
DRB3*0107	152	252, 255, 258, 262, 266, 269, 272, 273, 275, 277, 279
DRB3*0201	154	254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 280
DRB3*02021	154	254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279
DRB3*02022	154	254, 257, 259, 262, 266, 269, 272, 274, 275, 277, 279
DRB3*02023	154	254, 257, 259, 262, 266, 269, 272, 273, 276, 277, 279
DRB3*0203	154	254, 257, 259, 263, 266, 269, 272, 273, 275, 277, 279
DRB3*0204	154	254, 257, 259, 262, 266, 269, 271, 274, 275, 277, 280



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Table 14. (continued)

Correspondence of DRB3 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	High accuracy
DRB3*0205	154	254, 257, 258, 262, 266, 269, 272, 273, 275, 277, 279
DRB3*0206	154	254, 257, 259, 264, 266, 269, 272, 273, 275, 277, 279
DRB3*0207	154	254, 257, 259, 262, 266, 267, 272, 273, 275, 277, 279
DRB3*0208	154	254, 257, 259, 262, 266, 270, 272, 273, 275, 277, 279
DRB3*0210	154	254, 257, 259, 262, 265, 269, 272, 273, 275, 277, 279
DRB3*0211	154	254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279
DRB3*0212	154	254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279
DRB3*0301	154	254, 257, 258, 261, 265, 267, 272, 273, 275, 277, 280
DRB3*0302	154	254, 257, 259, 261, 265, 267, 272, 273, 275, 277, 280
DRB3*0303	154	254, 257, 258, 261, 265, 267, 271, 273, 275, 277, 279

Table 15.

Correspondence of DRB4 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB4*01011	155	281, 284, 286, 288
DRB4*0102		282, 284, 287
DRB4*0103101	155	281, 284, 287, 288
DRB4*0103102 N		287
DRB4*01032	155	281, 284, 287, 289
DRB4*0104	155	283, 284
DRB4*0105	155	281, 285
DRB4*0201N	155	281, 284, 286
DRB4*0301N		286

Table 16.

Correspondence of DRB5 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB5*01011	156	290, 292, 295, 297, 302, 304, 306
DRB5*01012	156	290, 292, 295, 297, 300, 305, 306
DRB5*0102	156	291, 293, 295, 297, 302, 304, 306
DRB5*0103	156	291, 293, 295, 298, 304, 306
DRB5*0104	156	290, 292, 295, 297, 303, 306
DRB5*0105	156	290, 294, 295, 297, 302, 304, 306
DRB5*0106	156	290, 292, 296, 299, 301, 305, 307

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Table 16. (continued)

Correspondence of DRB5 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB5*0107	156	290, 292, 296, 297, 302, 305, 307
DRB5*0108 N	156	291, 293, 295, 297, 302, 304, 306
DRB5*0109	156	290, 292, 295, 297, 302, 304, 306
DRB5*0110 N	156	291, 293, 295, 297, 302, 304, 306
DRB5*0202	156	291, 293, 296, 299, 301, 305, 306
DRB5*0203	156	291, 293, 296, 299, 301, 305, 306
DRB5*0204	156	291, 293, 295, 299, 301, 305, 307

Table 17.

Correspondence of DRB2, DRB6 and DRB7 types and low accuracy typing and high accuracy typing capture oligos		
Type	Corresponding capture oligos	
	low accuracy	high accuracy
DRB2*0101		251
DRB6*0101	155	308, 310, 312, 314, 316, 318
DRB6*0201	155	309, 311, 313, 315, 317, 319
DRB6*0202		309, 311, 313, 315, 317, 320
DRB7*01011		321
DRB7*01012		322
DRB7*01011	155	323

Table 18.

Correspondence of DPA types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DPA1*0103	324, 326, 330, 331, 333, 336, 338, 341, 343, 345, 347
DPA1*0104	324, 326, 330, 331, 334, 336, 338, 341, 343, 345, 347
DPA1*0105	324, 326, 330, 331, 333, 336, 338, 341, 343, 345, 348
DPA1*0106	324, 326, 330, 331, 333, 337, 339, 341, 343, 345, 347
DPA1*02011	324, 327, 330, 331, 333, 337, 339, 342, 343, 345, 348
DPA1*02012	324, 326, 330, 331, 333, 337, 339, 342, 343, 345, 348
DPA1*02013	324, 326, 330, 331, 333, 337, 338, 342, 343, 345
DPA1*02014	324, 330, 331, 333, 337, 339, 342, 343, 345, 348
DPA1*02021	325, 327, 329, 331, 333, 337, 340, 342, 343, 345, 348
DPA1*02022	325, 327, 329, 331, 333, 337, 338, 342, 343, 345, 348
DPA1*0203	324, 327, 330, 331, 333, 336, 338, 342, 343, 345, 347
DPA1*0301	325, 327, 330, 331, 333, 336, 338, 341, 344, 345, 347
DPA1*0302	325, 327, 330, 331, 333, 336, 338, 341, 343, 345, 347

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Table 18. (continued)

Correspondence of DPA types and high accuracy typing capture oligos	
Type	Corresponding capture oligos
DPA1*0401	324, 326, 328, 332, 335, 336, 338, 342, 343, 346, 348

Table 19.

Correspondence of DPB high accuracy typing capture (1)	
Type	Corresponding capture oligos
DPB1*01011	349, 254, 358, 361, 366, 367, 376
DPB1*01012	350, 355, 358, 364, 365, 368, 373, 376
DPB1*02011	350, 354, 358, 364, 365, 368, 373, 376
DPB1*02012	350, 354, 358, 364, 365, 369, 376
DPB1*02013	350, 354, 358, 362, 365, 371, 376
DPB1*0202	349, 356, 358, 364, 365, 370, 374, 377
DPB1*0301	350, 354, 358, 363, 365, 367, 376
DPB1*0401	350, 354, 358, 364, 365, 368, 373, 376
DPB1*0402	350, 354, 358, 362, 365, 371, 376
DPB1*0501	349, 356, 358, 364, 365, 370, 374, 377
DPB1*0601	350, 354, 358, 364, 365, 368, 373, 376
DPB1*0801	351, 356, 358, 364, 365, 370, 374, 376
DPB1*0901	351, 356, 358, 364, 365, 368, 373, 376, 386, 388, 390, 393, 396
DPB1*1001	349, 356, 360, 361, 366, 367, 377, 384, 385, 388, 391, 393, 396
DPB1*11011	349, 356, 359, 361, 366, 367, 377, 384, 386, 388, 391, 393, 396
DPB1*11012	349, 356, 358, 361, 365, 367, 376, 386, 388, 392, 393, 396
DPB1*1301	351, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396
DPB1*1401	349, 354, 360, 361, 366, 367, 377, 384, 386, 388, 391, 395, 396
DPB1*1501	350, 354, 358, 364, 365, 368, 373, 376, 386, 388, 391, 393, 396
DPB1*1601	351, 356, 358, 364, 365, 370, 374, 376, 386, 388, 391, 393, 396
DPB1*1701	349, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 391, 395, 396
DPB1*1801	350, 354, 358, 364, 365, 371, 376, 386, 388, 392, 393, 396
DPB1*1901	349, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 391, 393, 396
DPB1*20011	349, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 391, 393, 396
DPB1*20012	349, 356, 358, 362, 365, 371, 376, 386, 388, 391, 393, 396
DPB1*2101	350, 354, 358, 362, 365, 371, 376, 386, 388, 391, 393, 396
DPB1*2201	350, 354, 358, 364, 365, 367, 376, 382, 386, 388, 391, 394, 396
DPB1*2301	350, 354, 358, 363, 365, 371, 376, 382, 386, 388, 391, 394, 396
DPB1*2401	349, 356, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396
DPB1*2501	349, 356, 358, 361, 366, 367, 376, 382, 386, 388, 393, 396
DPB1*26011	349, 356, 358, 361, 365, 367, 376, 382, 386, 388, 390, 393, 396
DPB1*26012	349, 356, 358, 361, 365, 367, 376, 382, 386, 388, 391, 393, 396

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Table 19. (continued)

Correspondence of DPB high accuracy typing capture (1)	
Type	Corresponding capture oligos
DPB1*2701	350, 354, 368, 363, 365, 368, 373, 377, 382, 386, 388, 391, 395, 396
DPB1*2801	349, 356, 358, 364, 365, 370, 374, 377, 386, 388, 390, 393, 396
DPB1*2901	351, 356, 358, 364, 365, 371, 376, 386, 388, 391, 393, 396
DPB1*3001	350, 354, 358, 363, 365, 367, 377, 382, 387, 391, 393, 396
DPB1*3101	350, 354, 358, 364, 365, 372, 375, 376, 386, 388, 391, 394, 396
DPB1*3201	350, 354, 358, 363, 365, 367, 376, 386, 388, 391, 394, 396
DPB1*3301	350, 354, 358, 362, 365, 367, 377, 382, 387, 391, 395, 396
DPB1*3401	351, 356, 358, 364, 365, 370, 374, 376, 382, 386, 388, 390, 393, 396
DPB1*3501	349, 356, 358, 362, 365, 371, 376, 382, 386, 388, 391, 393, 396
DPB1*3601	349, 356, 358, 364, 365, 368, 373, 376, 386, 388, 390, 393, 396
DPB1*3701	350, 354, 358, 362, 365, 371, 376, 382, 386, 388, 391, 393, 397
DPB1*3801	350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 391, 394, 396
DPB1*3901	350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 391, 395, 396
DPB1*4001	350, 354, 358, 364, 365, 368, 373, 378, 386, 388, 391, 394, 396

Table 20.

Correspondence of DPB types and high accuracy typing capture oligos (2)	
Type	Corresponding capture oligos
DPB1*4101	349, 356, 358, 362, 365, 370, 374, 377, 386, 388, 390, 393, 396
DPB1*4401	351, 356, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396
DPB1*4501	350, 354, 358, 364, 365, 370, 374, 376, 386, 388, 391, 394, 396
DPB1*4601	350, 354, 358, 364, 365, 371, 376, 386, 388, 391, 394, 396
DPB1*4701	350, 354, 358, 362, 365, 368, 373, 376, 386, 388, 391, 394, 396
DPB1*4801	350, 354, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396
DPB1*4901	349, 354, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396
DPB1*5001	350, 354, 358, 363, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396
DPB1*5101	349, 356, 358, 364, 365, 367, 377, 382, 386, 388, 390, 393, 396
DPB1*5201	350, 354, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 395, 396
DPB1*5301	351, 356, 358, 364, 365, 371, 376, 386, 388, 390, 393, 396
DPB1*5401	351, 356, 358, 364, 365, 367, 376, 386, 388, 391, 393, 396
DPB1*5501	349, 356, 358, 363, 365, 367, 377, 382, 386, 388, 390, 393, 396
DPB1*5601	350, 354, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396
DPB1*5701	351, 356, 358, 362, 365, 367, 376, 386, 388, 391, 393, 396
DPB1*5801	350, 354, 358, 364, 365, 368, 373, 377, 382, 386, 388, 391, 394, 396
DPB1*5901	350, 354, 358, 364, 365, 368, 373, 379, 382, 386, 388, 391, 394, 396
DPB1*6001	349, 356, 358, 364, 365, 370, 374, 380, 381, 385, 386, 388, 390, 393
DPB1*6101N	350, 354, 358, 362, 365, 367, 376, 382, 386, 388, 391, 395, 396

Table 20. (continued)

Correspondence of DPB types and high accuracy typing capture oligos (2)	
Type	Corresponding capture oligos
DPB1*6201	350, 354, 358, 362, 365, 367, 376, 382, 386, 388, 391, 393, 396
DPB1*6301	352, 356, 358, 364, 365, 370, 374, 377, 386, 388, 391, 393, 396
DPB1*6401N	350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 390, 393, 396
DPB1*6501	351, 356, 358, 363, 365, 367, 376, 382, 386, 388, 391, 394, 396
DPB1*6601	351, 356, 358, 364, 365, 367, 377, 382, 386, 388, 390, 393, 396
DPB1*6701	350, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396
DPB1*6801	349, 356, 358, 364, 365, 370, 374, 377, 384, 386, 388, 391, 393, 396
DPB1*6901	353, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396
DPB1*7001	350, 354, 358, 364, 365, 367, 376, 386, 388, 391, 394, 396
DPB1*7101	350, 354, 358, 363, 365, 367, 377, 382, 386, 388, 391, 394, 396
DPB1*7201	350, 354, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 394, 396
DPB1*7301	349, 356, 359, 364, 366, 367, 377, 386, 388, 391, 395, 396
DPB1*7401	350, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 394, 396
DPB1*7501	351, 356, 358, 363, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396
DPB1*7601	350, 357, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396
DPB1*7701	349, 356, 358, 364, 365, 370, 374, 377, 382, 389, 390, 393, 396
DPB1*7801	349, 356, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396
DPB1*7901	349, 356, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396

**[0068]** The kit of the present invention includes a substrate on which capture oligos are immobilized. The kit of the present invention can include primers for preparing a nucleic acid target or reagents for hybridization such as a labeled nucleic acid target, buffer and enzyme conjugate recognizing a hapten.

#### Brief Description of the Drawings

#### **[0069]**

Fig. 1 shows positions of capture oligos (for HLA-DQA1) immobilized on a substrate. Numbers in the figure represent sequence numbers (the same shall apply in Figs. 2-7).

Fig. 2 shows positions of capture oligos (for HLA-DQB1) immobilized on a substrate.

Fig. 3 shows positions of capture oligos (for HLA-DRA) immobilized on a substrate.

Fig. 4 shows positions of capture oligos (for HLA-DRB1) immobilized on a substrate.

Fig. 5 shows positions of capture oligos (for HLA-DRB3, HLA-DRB4, HLA-DRB5 and HLA-DRB6) immobilized on a substrate.

Fig. 6 shows positions of capture oligos (for HLA-DPA1) immobilized on a substrate.

Fig. 7 shows positions of capture oligos (for HLA-DPB1) immobilized on a substrate.

Fig. 8 shows a schematic view of a kit of the present invention and a detection result of DRA typing using the same (detection result typed as DRA\*0101).

**[0070]** Numbers in the figure represent sequence numbers. B indicates that an oligonucleotide in which biotin is introduced at 5' end is immobilized, indicates that hybridization is not obtained. indicates that a hybridization signal is obtained (the same shall apply in Figs. 9 and 10).

Fig. 9 shows a schematic view of the kit of the present invention and a detection result of DRB low resolution typing using the same (detection result typed as DR4).

Fig. 10 shows a schematic view of the kit of the present invention and a detection result of DRB1 high resolution typing using the same (detection result typed as DRB\*04011).

Fig. 11 shows positions of capture oligos (for HLA-DPB1) immobilized on a substrate.

Fig. 12 shows positions of capture oligos (for HLA-DQB1) immobilized on a substrate.

Fig. 13 shows positions of capture oligos (for HLA-DRB1) immobilized on a substrate.

Fig. 14 shows positions of capture oligos (for HLA-DRB pseudogene) immobilized on a substrate.

Fig. 15 shows positions of capture oligos (for HLA-DPB3, 4, 5) immobilized on a substrate.

Fig. 16 shows positions of capture oligos (for HLA-A) immobilized on a substrate.

Fig. 17 shows positions of capture oligos (for HLA-B) immobilized on a substrate.

Fig. 18 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DPB1 typing using the same (detection result typed as DPB1\*01011) (B).

Fig. 19 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DQB1 typing using the same (detection result typed as DQB1\*05031) (B).

Fig. 20 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB1 typing using the same (detection result typed as DRB1\*0101) (B).

Fig. 21 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB9 typing using the same (detection result typed as DRB9 0101) (B).

Fig. 22 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB3 typing using the same (detection result typed as DRB3 0301) (B).

Fig. 23 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of A typing using the same (detection result typed as A 01011) (B).

Fig. 24 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of B typing using the same (detection result typed as B 0724) (B).

## Best Mode for Carrying out the Invention

**[0071]** Hereafter, the present invention will be explained more specifically with reference to the following examples.

### Example 1. Synthesis of oligonucleotides

**[0072]** According to a usual method, oligonucleotides having an amino group or hydroxyl group at 5' end were synthesized by using an oligonucleotide synthesizer (Perkin-Elmer Applied Biosystems), deprotected and dried. These dried oligonucleotides were dissolved in a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA to prepare 100 pmol/μL solutions of oligonucleotides. This synthesis method can be employed both for oligonucleotides used as capture oligos and those used as primers. The nucleotide sequences of the synthesized oligonucleotides are listed in Sequence Listing as SEQ ID NOS: 1-447. Among these, SEQ ID NOS: 1-397 are capture oligos and SEQ ID NOS: 398-447 are primers.

### Example 2. Spotting of capture oligos on substrate (utilizing oligonucleotide having amino group at 5' end)

**[0073]** In an amount of 10 μL of a microspotting solution (TeleChem International Inc.) was mixed with 10 μL of a solution of oligonucleotide having an amino group at 5' end and added onto a microtiter plate (Greiner Laboratory Inc.). Silanized slide glass (Matsunami Glass Ind. Ltd.) was placed at a predetermined position in a spotting machine and then the spotting machine was operated. After the spotting was completed, the slide glass was exposed to vapor from hot water for a few seconds and then irradiated with ultraviolet ray of 30 mJ. After exposed to vapor again for a few seconds, the slide glass was placed on a hot plate to remove moisture. The slide glass was rinsed with 0.1% sodium dodecyl sulfate aqueous solution and then with distilled water. The slide glass was blocked by immersing it in 100 mM Tris-HCl (pH 7.5), 100 mM NaCl and 0.1% Triton X-100 containing 3% bovine serum albumin (BSA) at room temperature for 30 minutes. Then, after dried at room temperature, the slide glass was washed with a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA. The slide glass was dried at room temperature again and maintained in a dry state in a dark cold place until use.

### Example 3. Spotting of capture oligos on substrate (utilizing oligonucleotide having hydroxyl group at 5' end)

**[0074]** In an amount of 10 μL of a microspotting solution (2 M sodium chloride aqueous solution) was mixed with 10 μL of a solution of oligonucleotide having a hydroxyl group at 5' end and added onto a microtiter plate (Greiner Laboratory Inc.). Silanized slide glass (Matsunami Glass Ind. Ltd.) was placed at a predetermined position in a spotting machine and then the spotting machine was operated. After the spotting was completed, the slide glass was placed

in a drier at 37°C for 30 minutes. The slide glass was blocked by immersing it in 100 mM Tris-HCl (pH 7.5), 100 mM NaCl and 0.1% Triton X-100 containing 3% bovine serum albumin (BSA) at room temperature for 30 minutes. Then, after dried at room temperature, the slide glass was washed with a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA. The slide glass was dried at room temperature again and maintained in a dry state in a dark cold place until use.

#### Example 4. Preparation of nucleic acid target

**[0075]** Nucleated cells were collected from peripheral blood, cultured cells or the like, placed in a microtube and washed 3 times with physiological saline. The cells were added and mixed with 800 µl of 0.1 M Tris-HCl (pH 8.0), 0.2 M NaCl, 0.04 M EDTA and 2% SDS, then added with 120 µg of proteinase K and incubated overnight at 50°C. The mixture was added with 800 µl of 1 M Tris-HCl saturated phenol was added and rotated on a rotator for 1 hour or longer, and extracted 3 times with phenol to remove proteins. The aqueous layer was added with 2 ml of 2-propanol and 60 µl of 5 M NaCl and gently mixed, and then the precipitated DNA was quickly sucked up with a micropipette. The DNA was washed 3 times by centrifugation with addition of 70% cold ethanol. The DNA was dried under reduced pressure and dissolved in 70 µl of sterilized water to prepare a PCR template solution.

**[0076]** The composition for PCR amplification consisted of 2 units of Taq polymerase, 25 pmol each of primers, 5 µl of reaction buffer, 10 nmol each of dNTP, 0.5 µl of template DNA solution and sterilized water giving a total volume of 50 µl. The solution placed in a tube was set on a thermal cycler. A program was operated such that, out of a cycle of (1) 95°C, 3 minutes, (2) 95°C, 30 seconds, (3) 71°C, 30 seconds and (4) 72°C, 3 minutes, (2) and (3) should be repeated 30 times.

**[0077]** In this example, agarose gel electrophoresis described below was performed as a confirmation test, but is not required in identification in an actual clinical case. In an amount of 1 µl of the PCR reaction mixture was taken and mixed with 1 µl of 6 x migration pigment (30% glycerol, 0.25% Bromophenol Blue, 0.25% xylene cyanol) and 4 µl of distilled water. After electrophoresis was performed on 2% agarose gel for 90 minutes at 100 V, the gel was immersed in distilled water containing 0.5 µg/ml of ethidium bromide for 30 minutes and photographed under ultraviolet ray irradiation by using a CCD camera.

#### Example 5. Hybridization

**[0078]** In an amount of 2 µl of the nucleic acid target prepared in Example 4 was taken and mixed with 8 µl of ArrayIt Unihyb Hybridization Solution (TeleChem International Inc.), subjected to a heat treatment at 100°C for 10 minutes, and then immersed in ice for 5 minutes. In an amount of 5 µl of this nucleic acid target solution was taken and placed on a substrate on which the capture oligos prepared in Example 2 or 3 were immobilized and then cover glass was placed thereon. This substrate was placed in a moisture box, further placed in an incubator set at 42°C and left for 60 minutes. The substrate was taken out from the incubator and quickly immersed in 5 x SSC (0.083 M NaCl and 0.083 M sodium citrate) at 4°C to remove the cover glass. Immersion of the substrate in 5 x SSC at 4°C for 10 minutes was repeated twice and then the substrate was rinsed twice with 3 M tetramethylammonium chloride aqueous solution at room temperature. Immersion of the substrate in 3 M tetramethylammonium chloride aqueous solution at 45°C for 20 minutes was repeated twice. Finally, the substrate was immersed in 2 x SSC (0.033 M NaCl and 0.033 M sodium citrate).

#### Example 6. Detection of chemical color development

**[0079]** After hybridization was completed in Example 5, the substrate was taken out from 2 x SSC. Block Ace (Dainippon Pharmaceutical Co., Ltd.) stock solution (4% aqueous solution) was placed on the substrate in an amount of 70 µl per cm<sup>2</sup> and left at room temperature for 20 minutes, and then the solution was removed. Subsequently, a mixed solution obtained by adding 2 drops each of avidin DH (Vector Laboratories, Inc.) and biotinylated horseradish peroxidase H (Vector Laboratories, Inc.) to 5 ml of TBST (0.05 M Tris-HCl (pH 7.6), 0.15 M NaCl, 0.05% Tween 20) and mixing them was placed on the substrate in an amount of 70 µl per cm<sup>2</sup> and left at room temperature for 30 minutes, and then the solution was removed. After immersion of the substrate in TBST at room temperature for 5 minutes was repeated twice, the substrate was taken out from the buffer and the moisture was sufficiently removed with paper towel. A TMB (3,3',5,5'-tetramethylbenzidine) color development substrate kit (Vector Laboratories, Inc.) was placed on the substrate in amount of 70 µl per cm<sup>2</sup> and left at room temperature for 10 minutes, and then the solution was removed. The substrate was immersed in deionized water to stop the enzymatic reaction.

**[0080]** The results of the above examples are shown in Figs. 8-10. It is evident that HLA typing can be carried out by the method of the present invention.

**[0081]** According to the present invention, there are provided a kit and method that enable multiple specimen processing and a highly precise HLA typing with one time of test as well as oligonucleotides and primers for use in the same.

Example 7. Typing using Patchworks

**[0082]** Oligonucleotides used for preparation of arrays were synthesized in a similar manner as Example 1. Arrays were prepared in a similar manner as Example 2 or 3.

5 Correspondence of the sequences of oligonucleotides used in arrays for typing HLA and HLA types are shown in Tables 21-32. For amplifying targets, combinations of primers shown in Table 33 were used. Typing was performed in a similar manner as Examples 4-6.

**[0083]** The results are shown in Figs. 18-24. Thus, HLA typing of the test specimen can be performed with the arrays which were prepared using oligonucleotides designed according to patchworks and satellites.

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Table 21

Correspondence of the patchwork regions and satellite regions for types of DPB1												
	patchwork region							satellite region				
	DPB1	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21					
DPB1#01011	DPB1	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21					
DPB1#6501	DPB1	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21					
DPB1#01012	DPB1	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21	473				
DPB1#8901	DPB1	DPB4	DPB7	DPB12	DPB15	DPB19	DPB21					
DPB1#1301	DPB2	DPB4	DPB7	DPB12	DPB16	DPB20	DPB21					
DPB1#26011	DPB2	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21	473	495			
DPB1#26012	DPB2	DPB4	DPB7	DPB12	DPB15	DPB18	DPB21					
DPB1#2701	DPB2	DPB4	DPB7	DPB12	DPB15	DPB19	DPB21					
DPB1#8501	DPB2	DPB4	DPB7	DPB12	DPB15	DPB19	DPB21					456
DPB1#3901	DPB1	DPB4	DPB7	DPB12	DPB15	DPB19	DPB22					
DPB1#4001	DPB1	DPB4	DPB7	DPB12	DPB15	DPB19	DPB23					
DPB1#0401	DPB1	DPB3	DPB7	DPB12	DPB15	DPB19	DPB22					
DPB1#3301	DPB1	DPB3	DPB7	DPB12	DPB16	DPB19	DPB22					
DPB1#6601	DPB2	DPB3	DPB7	DPB12	DPB15	DPB19	DPB22					456
DPB1#2301	DPB1	DPB5	DPB7	DPB12	DPB15	DPB19	DPB22					
DPB1#7101	DPB1	DPB5	DPB7	DPB12	DPB16	DPB19	DPB22					
DPB1#5501	DPB2	DPB5	DPB7	DPB12	DPB16	DPB19	DPB21					456
DPB1#5801	DPB2	DPB6	DPB7	DPB12	DPB16	DPB19	DPB21					456
DPB1#6301	DPB1	DPB6	DPB7	DPB12	DPB15	DPB19	DPB21					
DPB1#6201	DPB1	DPB6	DPB7	DPB12	DPB15	DPB19	DPB23					
DPB1#1601	DPB1	DPB4	DPB8	DPB12	DPB16	DPB19	DPB21					
DPB1#4901	DPB1	DPB4	DPB8	DPB12	DPB15	DPB19	DPB22					
DPB1#5301	DPB1	DPB4	DPB8	DPB12	DPB15	DPB19	DPB23					
DPB1#0801	DPB1	DPB5	DPB8	DPB12	DPB16	DPB18	DPB21					

Table 21 (continued)

Correspondence of the patchwork regions and satellite regions for types of DPB1											
	patchwork region						satellite region				
	DPB1	DPB5	DPB8	DPB12	DPB15	DPB18	DPB21				
DPB1#6801	DPB1	DPB5	DPB8	DPB12	DPB15	DPB18	DPB21				
DPB1#7501	DPB1	DPB5	DPB8	DPB12	DPB15	DPB18	DPB22				
DPB1#02012	DPB1	DPB5	DPB8	DPB12	DPB16	DPB19	DPB22				
DPB1#3201	DPB1	DPB5	DPB8	DPB12	DPB16	DPB19	DPB22	481			
DPB1#4601	DPB1	DPB5	DPB8	DPB12	DPB16	DPB19	DPB22	482			
DPB1#6001	DPB1	DPB5	DPB8	DPB12	DPB15	DPB19	DPB22	487			
DPB1#7701	DPB1	DPB5	DPB8	DPB12	DPB15	DPB19	DPB22	464			
DPB1#8001	DPB1	DPB5	DPB8	DPB12	DPB15	DPB19	DPB22				
DPB1#8201	DPB1	DPB5	DPB8	DPB12	DPB15	DPB19	DPB22				
DPB1#0901	DPB2	DPB5	DPB8	DPB12	DPB16	DPB18	DPB21	482			456
DPB1#1001	DPB2	DPB5	DPB8	DPB12	DPB16	DPB18	DPB21				456
DPB1#3701	DPB2	DPB5	DPB8	DPB12	DPB16	DPB18	DPB21				
DPB1#3501	DPB2	DPB5	DPB8	DPB12	DPB15	DPB18	DPB21	482			456
DPB1#7901	DPB2	DPB5	DPB8	DPB12	DPB15	DPB18	DPB21				
DPB1#8801	DPB2	DPB5	DPB8	DPB12	DPB16	DPB18	DPB21	482			
DPB1#1701	DPB2	DPB5	DPB8	DPB12	DPB16	DPB19	DPB21	482			456
DPB1#0402	DPB2	DPB5	DPB8	DPB12	DPB15	DPB19	DPB22				
DPB1#1801	DPB1	DPB5	DPB8	DPB12	DPB15	DPB19	DPB23				
DPB1#4801	DPB1	DPB6	DPB8	DPB12	DPB16	DPB19	DPB22				
DPB1#5101	DPB1	DPB3	DPB8	DPB12	DPB15	DPB19	DPB22				
DPB1#8101	DPB1	DPB3	DPB8	DPB12	DPB16	DPB19	DPB22				
DPB1#02013	DPB1	DPB5	DPB9	DPB12	DPB16	DPB19	DPB22				
DPB1#4701	DPB1	DPB5	DPB10	DPB12	DPB16	DPB19	DPB22				
DPB1#1901	DPB1	DPB5	DPB10	DPB12	DPB16	DPB20	DPB21				

Table 21 (continued)

Correspondence of the patchwork regions and satellite regions for types of DPB1												
	patchwork region								satellite region			
	DPB1±3001	DPB2	DPB5	DPB10	DPB12	DPB16	DPB19	DPB21				456
	DPB1±5401	DPB2	DPB5	DPB10	DPB12	DPB16	DPB18	DPB21				456
	DPB1±0202	DPB1	DPB6	DPB10	DPB12	DPB16	DPB19	DPB22				
	DPB1±2201	DPB1	DPB6	DPB10	DPB12	DPB16	DPB19	DPB21				
	DPB1±0501	DPB1	DPB6	DPB10	DPB12	DPB15	DPB19	DPB21				
	DPB1±3801	DPB1	DPB6	DPB10	DPB12	DPB15	DPB19	DPB21	465			
	DPB1±2101	DPB2	DPB6	DPB10	DPB12	DPB16	DPB19	DPB21				
	DPB1±3601	DPB2	DPB6	DPB10	DPB12	DPB15	DPB19	DPB21				
	DPB1±2401	DPB1	DPB3	DPB10	DPB12	DPB15	DPB19	DPB22				
	DPB1±8401	DPB1	DPB5	DPB11	DPB12	DPB15	DPB18	DPB22				
	DPB1±11011	DPB2	DPB4	DPB7	DPB13	DPB17	DPB19	DPB21	467	473		
	DPB1±11012	DPB2	DPB4	DPB7	DPB13	DPB17	DPB19	DPB21	466	467	473	
	DPB1±1501	DPB1	DPB4	DPB7	DPB13	DPB17	DPB19	DPB23	467	473		
	DPB1±7401	DPB2	DPB4	DPB7	DPB13	DPB17	DPB19	DPB23	467	473		
	DPB1±3101	DPB1	DPB3	DPB7	DPB13	DPB15	DPB19	DPB21				
	DPB1±5601	DPB2	DPB3	DPB7	DPB13	DPB15	DPB18	DPB21				
	DPB1±7201	DPB1	DPB3	DPB7	DPB13	DPB15	DPB19	DPB22				
	DPB1±3401	DPB1	DPB6	DPB7	DPB13	DPB15	DPB19	DPB23	493			
	DPB1±5201	DPB2	DPB5	DPB7	DPB13	DPB15	DPB18	DPB21				
	DPB1±03012	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482	503		
	DPB1±1401	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482			456
	DPB1±6101N	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB2	482			
	DPB1±7001	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482			457
	DPB1±2501	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21				

Table 21 (continued)

Correspondence of the patchwork regions and satellite regions for types of DPB1											
	patchwork region						satellite region				
	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21				
DPB1#4501	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21				456
DPB1#6701	DPB2	DPB5	DPB7	DPB13	DPB15	DPB18	DPB21				456
DPB1#7801	DPB2	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482			
DPB1#2901	DPB2	DPB5	DPB8	DPB13	DPB16	DPB18	DPB21	482			
DPB1#0601	DPB2	DPB5	DPB8	DPB13	DPB16	DPB19	DPB21	482			
DPB1#20011	DPB2	DPB5	DPB8	DPB13	DPB15	DPB19	DPB21	482			
DPB1#20012	DPB2	DPB5	DPB8	DPB13	DPB15	DPB19	DPB21	482			
DPB1#6401N	DPB2	DPB5	DPB8	DPB13	DPB16	DPB19	DPB21				
DPB1#6901	DPB2	DPB5	DPB8	DPB13	DPB17	DPB19	DPB21	482			
DPB1*5001	DPB1	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482			
DPB1#5701	DPB1	DPB5	DPB8	DPB13	DPB15	DPB18	DPB21	482			
DPB1#5901	DPB1	DPB5	DPB8	DPB13	DPB15	DPB19	DPB22				
DPB1#7301	DPB1	DPB5	DPB8	DPB13	DPB15	DPB18	DPB22				
DPB1#8701	DPB2	DPB5	DPB7	DPB13	DPB15	DPB19	DPB22				
DPB1#2801	DPB1	DPB3	DPB8	DPB13	DPB15	DPB19	DPB23				
DPB1#7601	DPB2	DPB3	DPB8	DPB13	DPB15	DPB18	DPB21	482			456
DPB1#4401	DPB2	DPB6	DPB8	DPB13	DPB16	DPB18	DPB21	482			
DPB1#03011	DPB2	DPB5	DPB10	DPB13	DPB15	DPB18	DPB21	482			
DPB1#4101	DPB1	DPB5	DPB8	DPB14	DPB16	DPB19	DPB22				
DPB1#8301	DPB1	DPB5	DPB8	DPB14	DPB15	DPB19	DPB22				
DPB1#8601	DPB2	DPB5	DPB8	DPB9	DPB16	DPB19	DPB22	482			

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Table 22.

Correspondence of Patchwork DPB1 and SEQ ID NOS. for DPB1			
Patchwork	SEQ ID NOS.		
F	458	460	462
DPB2	459	461	463
DPB3	468		
DPB4	469	472	
DPB5	470		
DPB6	471		
DPB7	474		
DPB8	475	479	480
DPB9	476		
DPB10	477		
DPB11	478		
DPB12	483		
DPB13	484	486	
DPB14	485		
DPB15	489	92	
DPB16	490		
DPB17	491		
DPB18	496	498	
DPB19	497		
DPB20	499		
DPB21	500		
DPB22	501		
DPB23	502		

Table 23 Correspondence of the patchwork regions and satellite regions for lypes of DQB1

pailchwork region										satellite region								
Q081*0201	Q081	Q085	Q088	Q0810	Q0815	Q0819	Q0823	Q0826	Q0830	Q0834	514	525	527	539	549	552	553	581
Q081*0202	Q081	Q085	Q088	Q0810	Q0815	Q0819	Q0823	Q0826	Q0830	Q0834	514	525	527	539	549	552	553	581
Q081*0203	Q081	Q085	Q088	Q0810	Q0815	Q0819	Q0823	Q0826	Q0830	Q0834	514	525	527	539	549	552	553	581
Q081*05031	Q081	Q084	Q087	Q0810	Q0814	Q0818	Q0822	Q0826	Q0830	Q0833	514	525	527	529	539	549	552	581
Q081*03032	Q081	Q085	Q088	Q0811	Q0814	Q0818	Q0822	Q0827	Q0830	Q0835	526	549	553	582	583			
Q081*0310	Q081	Q086	Q089	Q0811	Q0814	Q0818	Q0822	Q0827	Q0830	Q0835	526	549	582	583				
Q081*03033	Q081	Q085	Q088	Q0812	Q0814	Q0818	Q0822	Q0827	Q0830	Q0835	526	553	582	583				
Q081*06011	Q083	Q086	Q089	Q0810	Q0814	Q0818	Q0823	Q0827	Q0831		513	526	530	549	580	582	583	
Q081*06013	Q086	Q089	Q0810	Q0814	Q0818	Q0823	Q0827	Q0831			513	526	530	549	580	582	583	
Q081*0306	Q081	Q085	Q088	Q0811	Q0814	Q0818	Q0823	Q0825	Q0830	Q0835	515	526	549	553	571	582	583	
Q081*0401	Q082	Q085	Q087	Q0812	Q0814	Q0818	Q0823	Q0825	Q0830		515	516	526	549	553	556	571	585
Q081*0402	Q082	Q085	Q087	Q0812	Q0814	Q0818	Q0823	Q0825	Q0830		515	526	549	553	556	571	585	
Q081*05032	Q087	Q0810	Q0814	Q0820	Q0822						549							
Q081*0302	Q081	Q085	Q088	Q0811	Q0814	Q0819	Q0822	Q0827	Q0830	Q0833	526	549	553	582	583			
Q081*0307	Q081	Q085	Q088	Q0811	Q0814	Q0819	Q0822	Q0827	Q0830	Q0835	526	550	553	582	583			
Q081*0308	Q081	Q085	Q088	Q0811	Q0814	Q0819	Q0822	Q0828	Q0830	Q0835	526	549	553	582	583			
Q081*0305	Q081	Q085	Q087	Q0812	Q0814	Q0819	Q0822	Q0827	Q0830	Q0835	515	526	549	553	582	583		
Q081*0309	Q081	Q086	Q089	Q0811	Q0813	Q0818	Q0822	Q0827	Q0830	Q0835	526	538	549	553	582	583		
Q081*03011	Q081	Q086	Q089	Q0811	Q0813	Q0818	Q0822	Q0827	Q0830	Q0835	526	538	549	553	582	583		
Q081*03012	Q081	Q086	Q089	Q0812	Q0813	Q0818	Q0822	Q0827	Q0830	Q0835	526	538	549	553	582	583		
Q081*05011	Q081	Q084	Q087	Q0810	Q0813	Q0816	Q0822	Q0824	Q0829		549	584						
Q081*05012	Q081	Q084	Q087	Q0810	Q0813	Q0816	Q0822	Q0824	Q0829		524	549	582	583				
Q081*06041	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0827	Q0832		524	548	549	582	583			
Q081*06042	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0827	Q0832		524	548	549	582	583			
Q081*0606	Q081	Q084	Q088	Q0812	Q0813	Q0816	Q0822	Q0827	Q0832		524	526	549	581				
Q081*0609	Q088	Q0812	Q0816	Q0822	Q0827	Q0832					524	526	549	582	583			
Q081*06051	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0827	Q0832		524	526	549	582	583			
Q081*0608	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0828	Q0831		524	548	549	582	583			
Q081*0613	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0828	Q0831		526	548	549	582	583			
Q081*0612	Q082	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0828	Q0832		524	526	549	582	583			
Q081*0617	Q081	Q085	Q088	Q0812	Q0813	Q0816	Q0822	Q0824	Q0832		524	549	582	583				
Q081*0502	Q081	Q084	Q087	Q0810	Q0813	Q0817	Q0822	Q0824	Q0829		549	584						
Q081*0504	Q081	Q084	Q087	Q0810	Q0813	Q0817	Q0823	Q0825	Q0833		526	549						
Q081*0610	Q082	Q085	Q088	Q0812	Q0813	Q0817	Q0822	Q0828	Q0831		526	548	549	582	583			
Q081*06111	Q082	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0828	Q0831		526	548	549	582	583			
Q081*06112	Q081	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0828	Q0831		524	526	548	549	582	583		
Q081*0603	Q081	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0828	Q0831		524	548	549	582	583			
Q081*0616	Q082	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0828	Q0831		526	548	549	570	582	583		
Q081*0614	Q082	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0828	Q0831		524	548	549	582	583			
Q081*0615	Q081	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0827	Q0832		526	548	549	582	583			
Q081*0607	Q082	Q085	Q088	Q0812	Q0813	Q0820	Q0822	Q0827	Q0832		524	548	549	582	583			
Q081*0304	Q081	Q086	Q089	Q0811	Q0813	Q0819	Q0822	Q0827	Q0830	Q0835	526	538	549	582	583			
Q081*06052	Q088	Q0812	Q0821	Q0822	Q0827						524	526	549	582	583			

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Table 24

Correspondence of the patchworks and SEQ ID Nos for DQB1						
patchwork SEQ ID NO:						
DQB1	507					
DQB2	508					
DQB3	509					
DQB4	510					
DQB5	511					
DQB6	512					
DQB7	517	520	522			
DQB8	518	521	523			
DQB9	519					
DQB10	533	536	537			
DQB11	534					
DQB12	535					
DQB13	540	543	544	545	546	547
DQB14	541					
DQB15	542					
DQB16	559					
DQB17	560					
DQB18	561	565	568	569		
DQB19	562	566				
DQB20	563	567				
DQB21	564					
DQB22	572					
DQB23	573					
DQB24	574					
DQB25	575					
DQB26	576					
DQB27	577	579				
DQB28	578					
DQB29	586					
DQB30	587					
DQB31	588					
DQB32	589					
DQB33	528	532				
DQB34	554	557				
DQB35	555	558				

Table 25-1 Correspondence of the patchwork regions and satellite regions for types of DRB1

		patchwork region													satellite region	
5	DRB1*0101	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D51	D59	D63	D70	D73	
	DRB1*0419	D1	D5	D10	D16	D23	D29	D31	D48	D51	D59	D63	D70	D73		
	DRB1*0105	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D51	D59	D63	D70	D73	688
	DRB1*01021	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D51	D59	D63	D71	D74	791
	DRB1*0104	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D51	D59	D63	D70	D74	783
10	DRB1*01022	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D51	D59	D69	D71	D74	791
	DRB1*0406	D1	D5	D10	D16	D23	D29	D31	D48	D51	D59	D65	D70	D74		
	DRB1*0420	D1	D5	D10	D16	D23	D29	D31	D48	D51	D59	D65	D70	D73		
	DRB1*0106	D1	D4	DD11	D13	D18	D23	D29	D31	D48	D57	D59	D63	D70	D74	
	DRB1*0304	D1	D6	D10	D14	D19	D23	D30	D31	D48	D56	D59	D66	D70	D74	782
15	DRB1*0421	D1	D5	D10	D16	D23	D29	D31	D48	D56	D59	D63	D70	D73		
	DRB1*03021	D1	D5	D11	D14	D19	D24	D29	D31	D48	D56	D59	D66	D70	D73	782
	DRB1*0303	D1	D5	D11	D14	D19	D24	D29	D31	D48	D56	D59	D66	D70	D74	782
	DRB1*0306	D1	D6	D10	D14	D19	D24	D29	D31	D48	D56	D59	D66	D70	D74	782
	DRB1*0305	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D73	782
20	DRB1*0309	D1	D6	D10	D14	D21	D24	D30	D31	D48	D56	D59	D66	D70	D73	782
	DRB1*0307	D1	D5	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D74	782
	DRB1*03011	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D74	782
	DRB1*0311	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D67	D70	D74	782
	DRB1*03012	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D74	783
25	DRB1*0314	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D73	
	DRB1*0316	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D74	782
	DRB1*0315	D1	D6	D10	D14	D19	D24	D30	D31	D48	D56	D59	D66	D70	D74	699
	DRB1*1421	D1	D5	D10	D14	D19	D24	D30	D31	D48	D56	D59	D63	D70	D74	
30	DRB1*03022	D1	D5	D11	D14	D19	D24	D29	D31	D48	D56	D59	D66	D70	D73	783
	DRB1*1419	D1	D5	D11	D14	D19	D24	D29	D31	D48	D56	D59	D63	D70	D73	
	DRB1*1320	D1	D5	D10	D14	D19	D24	D30	D31	D48	D52	D59	D63	D70	D74	
	DRB1*1329	D1	D5	D10	D14	D19	D24	D30	D31	D48	D52	D59	D63	D70	D73	
	DRB1*1412	D1	D5	D11	D14	D19	D24	D29	D31	D48	D54	D59	D64	D70	D74	
	DRB1*1403	D1	D5	D11	D14	D19	D24	D29	D31	D48	D54	D59	D64	D70	D73	
35	DRB1*1406	D1	D5	D11	D14	D19	D24	D29	D31	D48	D51	D59	D63	D70	D74	
	DRB1*1417	D1	D5	D10	D14	D19	D24	D30	D31	D48	D51	D59	D63	D70	D74	
	DRB1*1433	D1	D5	D10	D14	D19	D24	D30	D31	D48	D51	D59	D65	D70	D74	
	DRB1*1430	D1	D5	D10	D14	D19	D24	D30	D31	D48	D51	D59	D63	D70	D73	
40	DRB1*1429	D1	D5	D11	D14	D19	D24	D29	D31	D48	D51	D59	D63	D70	D74	791
	DRB1*1402	D1	D5	D11	D14	D19	D24	D29	D31	D48	D51	D59	D63	D70	D73	
	DRB1*1409	D1	D5	D10	D14	D19	D24	D29	D31	D48	D51	D59	D63	D70	D73	
	DRB1*04031	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D65	D70	D74		
	DRB1*0407	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D65	D70	D73		
	DRB1*0427	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D65	D70	D74		791
45	DRB1*0404	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D63	D70	D74		
	DRB1*0408	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D63	D70	D73		
	DRB1*0423	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D63	D70	D74		799
	DRB1*0432	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D63	D70	D74		751
	DRB1*0431	D1	D5	D10	D16	D25	D29	D31	D48	D51	D59	D64	D70	D73		
50	DRB1*1344	D1	D5	D10	D13	D18	D25	D30	D31	D48	D51	D59	D63	D70	D74	
	DRB1*0317	D1	D5	D10	D13	D18	D25	D29	D31	D48	D56	D59	D67	D70	D73	699
	DRB1*04011	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D63	D70	D73		783
	DRB1*04012	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D63	D70	D73		665
	DRB1*0413	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D63	D70	D74		
	DRB1*0422	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D66	D70	D74		782
55	DRB1*0433	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D63	D70	D73		684



Table 25-2

	patchwork region														satellite region	
5	DRBI*0434	D1	D5	D10	D16	D25	D29	D31	D48	D56	D59	D63	D70	D73		
	DRBI*0435	D1	D5	D10	D16	D25	D30	D31	D48	D56	D59	D63	D70	D73		
	DRBI*0813	D2	D5	D10	D13	D18	D25	D29	D31	D48	D54	D59	D64	D70	D73	
	DRBI*1325	D1	D5	D10	D13	D18	D25	D30	D31	D48	D54	D59	D63	D70	D73	
	DRBI*10011	D1	D4	DD11	D17	D22	D25	D29	D31	D48	D55	D62	D63	D70	D73	752
10	DRBI*10012	D1	D4	DD11	D17	D22	D25	D29	D31	D48	D55	D60	D63	D70	D73	753
	DRBI*1414	D1	D5	D10	D14	D19	D26	D29	D31	D48	D55	D59	D65	D71	D73	
	DRBI*1436	D1	D5	D10	D14	D19	D26	D29	D31	D48	D55	D59	D65	D71	D73	686
	DRBI*1423	D1	D5	D10	D14	D19	D26	D29	D31	D48	D55	D59	D65	D71	D74	
	DRBI*1420	D1	D5	D11	D14	D19	D26	D29	D31	D48	D51	D59	D63	D70	D74	
15	DRBI*0103	D1	D4	DD11	D13	D18	D23	D29	D31	D49	D52	D59	D63	D70	D73	
	DRBI*15022	D1	D5	D10	D15	D20	D23	D30	D31	D49	D57	D59	D63	D70	D73	
	DRBI*1301	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D74	
	DRBI*1327	D1	D6	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D74	
	DRBI*1315	D1	D5	D11	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D74	
20	DRBI*1328	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D74	789
	DRBI*1340	D1	D5	D10	D14	D19	D24	D29	D31	D49	D52	D59	D63	D70	D74	
	DRBI*13021	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D73	
	DRBI*13022	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D60	D63	D70	D73	
	DRBI*1334	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D73	664
	DRBI*1335	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D73	687
25	DRBI*1336	D1	D5	D10	D14	D19	D24	D29	D31	D49	D52	D59	D63	D70	D73	
	DRBI*1341	D1	D6	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D73	
	DRBI*1316	D1	D5	D10	D14	D19	D24	D30	D31	D49	D52	D59	D63	D70	D75	
	DRBI*1306	D1	D5	D10	D14	D19	D24	D30	D31	D49	D54	D59	D63	D70	D74	
	DRBI*1310	D1	D5	D10	D14	D19	D24	D30	D31	D49	D53	D59	D63	D70	D74	
30	DRBI*1424	D1	D5	D11	D14	D19	D24	D29	D31	D49	D57	D59	D63	D70	D73	
	DRBI*1309	D1	D5	D10	D14	D19	D24	D30	D31	D49	D57	D59	D63	D70	D74	
	DRBI*0402	D1	D5	D10	D16	D25	D29	D31	D49	D52	D59	D63	D70	D74		
	DRBI*0414	D1	D5	D10	D16	D25	D29	D31	D49	D52	D59	D63	D70	D73		
	DRBI*1317	D2	D5	D10	D13	D18	D25	D30	D31	D49	D52	D59	D63	D70	D74	
35	DRBI*1322	D1	D5	D10	D13	D18	D25	D30	D31	D49	D52	D59	D63	D70	D74	
	DRBI*1323	D1	D5	D10	D13	D18	D25	D30	D31	D49	D52	D59	D63	D70	D73	
	DRBI*0418	D1	D5	D10	D16	D25	D29	D31	D49	D54	D59	D64	D70	D74		
	DRBI*1337	D1	D5	D10	D13	D18	D25	D29	D31	D49	D53	D59	D63	D70	D73	
	DRBI*1308	D1	D5	D10	D14	D19	D26	D29	D31	D49	D52	D59	D63	D70	D74	
40	DRBI*1319	D1	D5	D11	D14	D19	D26	D29	D31	D49	D52	D59	D63	D70	D74	
	DRBI*0425	D1	D5	D10	D16	D25	D29	D31	D50	D54	D59	D64	D70	D74		
	DRBI*0436	D1	D5	D10	D16	D25	D29	D31	D50	D54	D59	D63	D70	D74		
	DRBI*08021	D2	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D73	
	DRBI*08022	D2	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D73	
45	DRBI*08041	D2	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D74	
	DRBI*08042	*	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D75	
	DRBI*08043	D2	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D75	
	DRBI*0820	D1	D5	D10	D13	D18	D25	D29	D31	D50	D54	D59	D64	D70	D74	
	DRBI*1311	D1	D5	D10	D13	D18	D25	D30	D31	D50	D54	D59	D63	D70	D74	
	DRBI*13141	D1	D5	D10	D13	D18	D25	D30	D31	D50	D54	D59	D63	D70	D73	
50	DRBI*1324	D1	D5	D10	D13	D18	D25	D30	D31	D50	D52	D59	D63	D70	D74	
	DRBI*13071	D1	D5	D10	D13	D18	D25	D29	D31	D50	D53	D59	D63	D70	D73	
	DRBI*0809	D2	D5	D10	D14	D19	D26	D29	D31	D50	D54	D59	D64	D70	D73	
	DRBI*0821	D2	D5	D10	D14	D19	D26	D29	D31	D50	D54	D59	D64	D70	D73	
	DRBI*1415	D2	D5	D10	D14	D19	D26	D29	D31	D50	D54	D59	D64	D70	D74	
55	DRBI*1318	D1	D5	D10	D14	D19	D24	D30	D31	D50	D54	D59	D64	D70	D74	

Table 25-3

	patchwork region															satellite region	
5	DRB1*1342	D1	D5	D10	D14	D19	D24	D30	D31	D50	D54	D59	D63	D70	D74		
	DRB1*1427	D1	D5	D11	D14	D19	D24	D29	D31	D50	D54	D59	D64	D70	D73		
	DRB1*1305	D1	D5	D10	D14	D19	D24	D30	D31	D50	D53	D59	D63	D70	D73		
	DRB1*0312	D1	D6	D10	D14	D19	D24	D30	D32	D48	D56	D59	D66	D70	D74	782	
	DRB1*0411	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D65	D70	D74			
10	DRB1*0417	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D65	D70	D73			
	DRB1*0410	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D63	D70	D74			
	DRB1*04051	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D63	D70	D73			
	DRB1*04052	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D63	D70	D73		685	
	DRB1*0429	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D63	D70	D73		700	
15	DRB1*0430	D1	D5	D10	D16	D25	D29	D32	D48	D51	D59	D63	D70	D73		697	
	DRB1*0428	D1	D5	D10	D16	D25	D30	D32	D48	D51	D59	D63	D70	D73			
	DRB1*0409	D1	D5	D10	D16	D25	D29	D32	D48	D56	D59	D63	D70	D73			
	DRB1*0412	D1	D5	D10	D16	D25	D29	D32	D49	D54	D59	D64	D70	D74			
	DRB1*0810	D2	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D64	D70	D74		
20	DRB1*0812	D2	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D64	D70	D74	791	
	DRB1*08032	D2	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D64	D70	D73		
	DRB1*0814	D2	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D64	D70	D73		
	DRB1*1313	D1	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D64	D70	D73		
	DRB1*0818	D2	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D63	D70	D73		
25	DRB1*1312	D1	D5	D10	D13	D18	D25	D29	D32	D49	D54	D59	D63	D70	D73		
	DRB1*1330	D1	D5	D10	D13	D18	D25	D30	D32	D49	D54	D59	D63	D70	D73		
	DRB1*13031	D1	D5	D10	D13	D18	D25	D29	D32	D49	D53	D59	D63	D70	D73		
	DRB1*13032	D1	D5	D10	D13	D18	D25	D29	D32	D49	D53	D59	D63	D70	D73		
	DRB1*1333	D1	D5	D10	D13	D18	D25	D29	D32	D49	D53	D59	D63	D70	D73	782	
	DRB1*1304	D1	D5	D10	D13	D18	D25	D30	D32	D49	D52	D59	D63	D70	D74		
30	DRB1*1338	D1	D5	D10	D13	D18	D25	D29	D32	D49	D52	D59	D63	D70	D73		
	DRB1*1332	D1	D5	D10	D14	D19	D24	D29	D32	D49	D52	D59	D63	D70	D74		
	DRB1*0801	D2	D5	D10	D13	D18	D25	D29	D32	D50	D54	D59	D64	D70	D73		
	DRB1*0817	D2	D5	D10	D13	D18	D25	D30	D32	D50	D54	D59	D64	D70	D73		
	DRB1*0816	D2	D5	D10	D13	D18	D27	D29	D32	D50	D54	D59	D64	D70	D73		
35	DRB1*0806	D2	D5	D10	D13	D18	D25	D29	D32	D50	D54	D59	D64	D70	D74		
	DRB1*0822	D2	D5	D10	D13	D18	D25	D29	D32	D50	D54	D59	D64	D70	D74	791	
	DRB1*0805	D2	D5	D10	D13	D18	D25	D29	D32	D50	D54	D59	D63	D70	D73		
	DRB1*1321	D1	D5	D10	D13	D18	D25	D30	D32	D50	D54	D59	D63	D70	D73		
	DRB1*1413	D1	D5	D11	D14	D19	D24	D29	D32	D48	D51	D59	D63	D70	D73		
40	DRB1*0308	D1	D6	D10	D14	D19	D24	D30	D43	D48	D56	D59	D66	D70	D74	782	
	DRB1*1107	D1	D5	D10	D13	D18	D25	D30	D43	D48	D56	D59	D66	D70	D74	782	
	DRB1*11081	D1	D5	D10	D13	D18	D25	D30	D43	D48	D54	D59	D63	D70	D73		
	DRB1*11082	D1	D5	D10	D13	D18	D25	D30	D43	D48	D54	D59	D63	D70	D73		
	DRB1*1136	D1	D5	D10	D13	D18	D25	D30	D43	D48	D52	D59	D63	D70	D74		
45	DRB1*1126	D1	D5	D10	D13	D18	D25	D30	D43	D48	D51	D59	D63	D70	D73		
	DRB1*1134	D1	D5	D10	D13	D18	D25	D30	D43	D48	D51	D59	D63	D70	D74		
	DRB1*1113	D1	D5	D10	D14	D19	D26	D30	D43	D48	D55	D59	D63	D71	D74		
	DRB1*1117	D1	D5	D10	D14	D19	D26	D29	D43	D48	D55	D59	D65	D71	D74		
	DRB1*11011	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73		
50	DRB1*11012	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*11013	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D60	D63	D70	D73		
	DRB1*11271	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73	783	
	DRB1*11272	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73	782	
	DRB1*1130	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73	594	
	DRB1*1105	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73	597	
55	DRB1*1137	D1	D5	D10	D13	D18	D25	D29	D43	D50	D54	D59	D63	D70	D73		

Table 25-4

	patchwork region														satellite region		
	DRB1*0415	D1	D5	D10	D16	D25	D29	D43	D50	D54	D59	D63	D70	D74			
5	DRB1*1122	D1	D5	D10	D15	D20	D25	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*1139	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73	699	
	DRB1*1123	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D64	D70	D73		
	DRB1*1132	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D68	D70	D73		
	DRB1*1125	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D64	D70	D74		
10	DRB1*1106	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D74	791	
	DRB1*11041	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D74		
	DRB1*11042	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D74		
	DRB1*1111	D1	D5	D10	D13	D18	D25	D30	D43	D50	D52	D59	D63	D70	D73		
	DRB1*1141	D1	D5	D10	D13	D18	D25	D29	D43	D50	D52	D59	D63	D70	D74		
15	DRB1*1103	D1	D5	D10	D13	D18	D25	D30	D43	D50	D53	D59	D63	D70	D74		
	DRB1*1109	D1	D5	D10	D14	D19	D24	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*1128	D1	D5	D10	D13	D18	D24	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*1110	D1	D5	D10	D14	D19	D26	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*11121	D1	D5	D10	D13	D18	D26	D30	D43	D50	D54	D59	D63	D70	D73		
20	DRB1*1115	D1	D5	D10	D13	D18	D27	D30	D43	D50	D54	D59	D63	D70	D73	666	
	DRB1*1124	D1	D5	D10	D13	D18	D27	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*1129	D1	D5	D10	D13	D18	D23	D30	D43	D50	D54	D59	D63	D70	D73		
	DRB1*1119	D1	D5	D10	D13	D18	D25	D30	D43	D49	D54	D59	D63	D70	D73		
	DRB1*1118	D1	D5	D10	D13	D18	D25	D30	D43	D49	D54	D59	D63	D70	D74		
25	DRB1*1114	D1	D5	D10	D13	D18	D25	D30	D43	D49	D52	D59	D63	D70	D73		
	DRB1*1102	D1	D5	D10	D13	D18	D25	D30	D43	D49	D52	D59	D63	D70	D74		
	DRB1*1121	D1	D5	D10	D13	D18	D25	D30	D43	D49	D52	D59	D63	D70	D74	791	
	DRB1*1120	D1	D5	D10	D14	D19	D24	D30	D43	D49	D52	D59	D63	D70	D73		
	DRB1*1116	D1	D5	D10	D14	D19	D24	D30	D43	D49	D52	D59	D63	D70	D74		
30	DRB1*1204	D2	D8	D11	D14	D19	D28	D30	D43	D49	D54	D60	D63	D71	D74	D76	791
	DRB1*1131	D1	D5	D10	D13	D18	D25	D30	D43	D49	D54	D59	D63	D70	D73		718
	DRB1*1133	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D73		716
	DRB1*1135	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D74		716
	DRB1*1138	D1	D5	D10	D13	D18	D25	D30	D43	D50	D54	D59	D63	D70	D74		715
35	DRB1*1201	D2	D8	D11	D14	D19	D28	D30	D45	D49	D54	D60	D63	D71	D74	D76	791
	DRB1*1206	D2	D8	D11	D14	D19	D28	D30	D45	D49	D54	D60	D63	D71	D74	D76	791
	DRB1*12032	D2	D8	D11	D14	D19	D28	D30	D45	D49	D54	D60	D63	D70	D74	D76	
	DRB1*1205	D2	D8	D11	D14	D19	D26	D30	D45	D49	D54	D60	D63	D71	D74	D76	791
	DRB1*12021	D2	D8	D11	D14	D19	D28	D30	D45	D50	D54	D60	D63	D71	D74	D76	791
	DRB1*12022	D2	D8	D11	D14	D19	D28	D30	D45	D50	D54	D60	D63	D70	D74	D76	791
40	DRB1*07011	D1	D5	DD11	D15	D20	D26	D29	D45	D49	D58	D59	D67	D72	D73		
	DRB1*07012	D1	D5	DD11	D15	D20	D26	D29	D45	D49	D58	D59	D67	D72	D73		595
	DRB1*0703	D1	D5	DD11	D15	D20	D26	D29	D45	D49	D58	D59	D67	D72	D73		631
	DRB1*0704	D1	D5	DD11	D15	D20	D26	D29	D45	D49	D58	D59	D67	D70	D73		783
	DRB1*04032	D1	D5	D10	D16	D25	D29	D33	D48	D51	D59	D65	D70	D74			
45	DRB1*1505	D1	D5	D10	D15	D20	D23	D30	D33	D48	D57	D59	D63	D70	D74		
	DRB1*1506	D1	D5	D10	D15	D20	D23	D30	D33	D48	D57	D59	D63	D70	D74		698
	DRB1*16021	D1	D5	D10	D15	D20	D23	D29	D33	D48	D54	D60	D63	D70	D73		
	DRB1*16022	D1	D5	D10	D15	D20	D23	D29	D33	D48	D54	D59	D63	D70	D73		
	DRB1*13072	D1	D5	D10	D13	D18	D25	D29	D33	D50	D53	D59	D63	D70	D73		
50	DRB1*13142	D1	D5	D10	D13	D18	D25	D30	D33	D50	D54	D59	D63	D70	D73		
	DRB1*1326	D1	D5	D10	D14	D19	D24	D29	D33	D50	D54	D60	D63	D70	D73		
	DRB1*1608	D1	D5	D10	D15	D20	D24	D29	D33	D50	D54	D60	D63	D70	D73		
	DRB1*16011	D1	D5	D10	D15	D20	D23	D29	D33	D50	D54	D60	D63	D70	D73		
	DRB1*16012	D1	D5	D10	D15	D20	D23	D29	D33	D50	D54	D59	D63	D70	D73		
55	DRB1*1603	D1	D5	D10	D15	D20	D23	D29	D33	D50	D54	D61	D63	D70	D73		

Table 25-5

	patchwork region														satellite region			
5	DRB1*1604	D1	D5	D10	D15	D20	D23	D29	D33	D50	D54	D59	D64	D70	D73			
	DRB1*1504	D1	D5	D10	D15	D20	D23	D30	D33	D50	D57	D59	D63	D70	D74			
	DRB1*15011	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D74			
	DRB1*15012	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D74		790	
10	DRB1*1503	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D74		632	
	DRB1*1509	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D74		696	
	DRB1*1507	D1	D5	D10	D15	D20	D23	D29	D33	D49	D57	D59	D63	D70	D74			
	DRB1*15021	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D73			
	DRB1*15023	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D73			
15	DRB1*1508	D1	D5	D10	D15	D20	D23	D30	D33	D49	D57	D59	D63	D70	D73		725	
	DRB1*1510	D1	D5	D10	D15	D20	D23	D30	D33	D49	D52	D59	D63	D70	D74			
	DRB1*1605	D1	D5	D10	D15	D20	D23	D29	D33	D49	D54	D60	D63	D70	D73			
	DRB1*1607	D1	D5	D10	D15	D20	D23	D29	D33	D49	D54	D60	D63	D70	D73		618	
	DRB1*0416	D1	D5	D10	D16	D25	D29	D44	D48	D56	D59	D63	D70	D73				
20	DRB1*0426	D1	D5	D10	D16	D25	D29	D41	D48	D56	D59	D63	D70	D73				
	DRB1*0807	D2	D5	D10	D13	D18	D25	D29	D38	D50	D54	D59	D64	D70	D73			
	DRB1*0811	D2	D5	D10	D13	D18	D25	D29	D38	D50	D54	D59	D64	D70	D73			
	DRB1*0815	D2	D5	D10	D13	D18	D25	D29	D42	D49	D54	D59	D64	D70	D73		717	
	DRB1*0819	D2	D5	D10	D13	D18	D25	D29	D40	D49	D54	D59	D64	D70	D73			
25	DRB1*09012	D1	D7	D12	D13	D18	D24	D29	D38	D50	D55	D59	D65	D72	D73			
	DRB1*0808	D2	D5	D10	D13	D18	D25	D29	D36	D50	D54	D59	D64	D70	D73			
	DRB1*14011	D1	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D74			
	DRB1*1407	D1	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D73			
	DRB1*1410	D1	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D74		596	
30	DRB1*1426	D1	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D74		608	
	DRB1*1404	D2	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D74			
	DRB1*1428	D2	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D65	D71	D74		791	
	DRB1*1431	D2	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D63	D71	D74			
	DRB1*1432	D1	D5	D10	D14	D19	D26	D29	D36	D48	D55	D59	D63	D70	D74			
35	DRB1*1435	D1	D5	D10	D14	D19	D26	D30	D36	D48	D55	D59	D65	D71	D74			
	DRB1*1343	D1	D5	D10	D14	D19	D24	D30	D36	D48	D52	D59	D63	D70	D74			
	DRB1*1345	D1	D5	D10	D13	D18	D25	D30	D36	D49	D52	D59	D63	D70	D73			
	DRB1*1416	D1	D5	D10	D14	D19	D26	D29	D36	D49	D52	D59	D63	D70	D74			
	DRB1*0310	D1	D6	D10	D14	D19	D24	D30	D36	D48	D56	D59	D66	D70	D74		782	
40	DRB1*1422	D1	D5	D10	D14	D19	D26	D29	D36	D50	D54	D59	D63	D70	D73			
	DRB1*1425	D1	D5	D10	D13	D18	D25	D29	D36	D50	D54	D59	D63	D70	D73			
	DRB1*1331	D1	D5	D10	D14	D19	D24	D30	D34	D49	D52	D59	D63	D70	D73			
	DRB1*1339	D1	D5	D10	D14	D19	D24	D30	D35	D49	D52	D59	D63	D70	D73			
	DRB1*0313	D1	D6	D10	D14	D19	D24	D30	D35	D48	D56	D59	D66	D70	D74		782	
45	DRB1*1408	D1	D5	D10	D14	D19	D26	D29	D46	D48	D55	D59	D65	D71	D74			
	DRB1*1411	D2	D5	D10	D14	D19	D26	D29	D47	D48	D55	D59	D65	D71	D74			
	DRB1*1418	D1	D5	D11	D14	D19	D24	D29	D37	D48	D55	D59	D65	D71	D74			
	DRB1*1405	D3	D5	D10	D14	D19	D26	D29	D37	D48	D55	D59	D65	D71	D74			
	DRB1*1437	D3	D5	D10	D14	D19	D26	D29	D37	D49	D57	D59	D63	D70	D74			
50	DRB1*1434	D1	D5	D10	D14	D19	D26	D29	D46	D48	D55	D59	D63	D71	D74			

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Table 26

Correspondence of the patchworks and SEQ ID Nos for DRB1													
patchwork	SEQ ID NO:												
	600	603	604	605	606	607							
D1													
D2													
D3													
D4													
D5													
D6													
D7													
D8													
D9													
D10													
D11													
D12													
D13													
D14													
D15													
D16													
D17													
D18													
D19													
D20													
D21													
D22													
D23													
D24													

Table 26 (continued)  
Correspondence of the patchworks and SEQ ID Nos for DRB1

patchwork	SEQ ID NO:											
	669	675	679	681	682	683						
D25												
D26	670	676	680									
D27	671	677										
D28	672											
D29	689	691	693	695								
D30	690	692	694									
D31	701											
D32	702											
D33	703											
D34	704											
D35	705											
D36	706											
D37	707											
D38	708											
D39	709											
D40	710											
D41	711											
D42	712											
D43	713	722	723	724								
D44	714											
D45	719											
D46	720											
D47	721											
D48	726	729										

Table 26 (continued)

Correspondence of the patchworks and SEQ ID Nos for DRB1																
patchwork	SEQ ID NO:															
D49	727	730	732													
D50	728	731														
D51	733	741														
D52	734	742														
D53	735	743														
D54	736	744														
D55	737	745	747													
D56	738	746														
D57	739															
D58	740															
D59	748	754	756	758	759	760	761	762	763	764	765	767	768	769	770	770
D60	749	755	757													
D61	750															
D62	752															
D63	771	778	779	780	781											
D64	772															
D65	773															
D66	774															
D67	775															
D68	776															
D69	777															
D70	784	787	788													
D71	785															
D72	786															

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Table 26 (continued)

Correspondence of the patchworks and SEQ ID Nos for DRB1									
patchwork	SEQ ID NO:								
D73	792								
D74	793	795	796	797	798				
D75	794								
D76	597	598	599						



Table 27

Correspondence of the patchwork regions and satellite regions for types of DRB 3-5																			
	patchwork														satellite				
	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#01011	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#0101201	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#0101202	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#01014	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832	847	
DRB3#0102	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832	853	
DRB3#0103	R1	R3	R8	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#0104	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832	852	
DRB3#0105	R1	R3	R10	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52	832		
DRB3#0106	R1	R3	R7	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52			
DRB3#0209	R1	R2	R8	R16	R19	R21	R24	R27	R31	R32	R34	R40	R43	R46	R50	R52	832		
DRB3#0301	R1	R2	R8	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R46	R50	R53			
DRB3#03012	R1	R2	R8	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R46	R50	R53	832		
DRB3#0302	R1	R2	R8	R16	R19	R21	R25	R27	R31	R32	R34	R40	R43	R46	R50	R53			
DRB3#0303	R1	R2	R8	R17	R19	R21	R25	R27	R31	R32	R34	R40	R43	R45	R50	R52			
DRB3#01013	R1	R3	R7	R17	R19	R21	R25	R27	R32	R33	R34	R40	R43	R45	R50	R52	832		
DRB3#0107	R1	R3	R7	R17	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		834	847	
DRB3#02022	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		834	847	
DRB3#02010	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		832		
DRB3#02012	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		832	847	
DRB3#0205	R1	R2	R8	R17	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		832	847	
DRB3#02021	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		834	847	
DRB3#02011	R1	R2	R8	R16	R19	R21	R24	R27	R28	R35	R40	R43	R46	R50	R52		832	847	
DRB3#02023	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52		834	847	845
DRB3#0201	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R53		834	847	

Table 27 (continued)

Correspondence of the patchwork regions and satellite regions for types of DRB 3-5																			
	patchwork																	satellite	
	R1	R2	R8	R16	R19	R21	R22	R27	R28	R34	R40	R43	R46	R50	R52			847	
DRB3†0203	R1	R2	R8	R16	R19	R21	R22	R27	R28	R34	R40	R43	R46	R50	R52			847	
DRB3†0206	R1	R2	R8	R16	R19	R21	R23	R27	R28	R34	R40	R43	R46	R50	R52			832	847
DRB3†0204	R1	R2	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R45	R50	R52			832	847
DRB3†02013	R1	R4	R8	R16	R19	R21	R24	R27	R28	R34	R40	R43	R46	R50	R52			832	847
DRB3†0207	R1	R2	R8	R16	R19	R21	R24	R27	R31	R34	R40	R43	R46	R50	R52			832	847
DRB3†0208	R1	R2	R8	R16	R19	R21	R24	R27	R29	R34	R40	R43	R46	R50	R52			832	847
DRB4†0103101	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53				
DRB4†01032	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53				
DRB4†01011	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53				
DRB4†01033	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R51	R53				
DRB4†0102		R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53			843	
DRB4†0104	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53			844	
DRB4†0105	R1	R5	R10	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53				
DRB4†0201N	R1	R6	R11	R14	R18	R20	R24	R27	R30	R34	R39	R43	R48	R50	R53				
DRB5†01011	R1	R2	R12	R15	R18	R20	R26	R27	R30	R36	R38	R44	R49	R50	R52			833	
DRB5†01012	R1	R2	R12	R15	R18	R20	R26	R27	R30	R36	R38	R43	R49	R50	R52			833	
DRB5†0105	R1	R2	R12	R15	R18	R20	R26	R27	R30	R36	R38	R44	R49	R50	R52				
DRB5†0104	R1	R2	R12	R15	R18	R20	R26	R27	R30	R36	R38	R43	R47	R50	R52				
DRB5†0106	R1	R2	R12	R15	R18	R20	R26	R27	R30	R35	R41	R43	R49	R50	R53				
DRB5†0107	R1	R2	R12	R15	R18	R20	R26	R27	R30	R35	R38	R44	R49	R50	R52				
DRB5†0109	R1	R2	R12	R15	R18	R20	R26	R27	R30	R36	R42	R44	R49	R50	R52				
DRB5†0108N	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R38	R44	R49	R50	R52				
DRB5†0102	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R38	R44	R49	R50	R52				
DRB5†0110N	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R38	R44	R49	R50	R52				

Table 27 (continued)

Correspondence of the patchwork regions and satellite regions for types of DRB 3-5																
	patchwork													satellite		
	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R31	R44	R49	R50	R52	
DRB5±0103	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R31	R44	R49	R50	R52	
DRB5±0202	R1	R2	R12	R13	R18	R20	R23	R27	R30	R35	R41	R43	R49	R50	R53	
DRB5±0203	R1	R2	R12	R13	R18	R20	R23	R27	R30	R35	R41	R43	R49	R50	R52	
DRB5±0204	R1	R2	R12	R13	R18	R20	R23	R27	R30	R36	R41	R43	R49	R50	R53	848
DRB5±0205	R1	R2	R12	R13	R18	R20	R23	R27	R30	R34	R37	R43	R49	R50	R53	848

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Table 28

Correspondence of the patchworks and SEQ ID NOs for DRB 3-5					
Patchwork	SEQ ID NO:				
R1	603	604	607		
R2	610	803			
R3	611	804	805		
R4	800				
R5	801				
R6	802				
R7	620				
R8	621	810	812	813	
R9	806				
R10	807				
R11	808				
R12	809	811			
R13	814				
R14	815				
R15	816				
R16	817				
R17	818	819	820		
R18	643	821	822		
R19	823	824			
R20	825	826	659		
R21	827	828	652	829	
R22	673				
R23	668	678			
R24	682	831			
R25	676	680			
R26	830				
R27	689	691			
R28	701				
R29	702				
R30	703				
R31	704				
R32	837				
R33	838				
R34	726				
R35	727	730			
R36	728	731			

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Table 28 (continued)

Correspondence of the patchworks and SEQ ID NOs for DRB 3-5					
Patchwork	SEQ ID NO:				
R37	733				
R38	736	744	839		
R39	737				
R40	746				
R41	739				
R42	1072				
R43	658	659	662	667	841
R44	655	840			
R45	774				
R46	775				
R47	772	842			
R48	773				
R49	771	780			
R50	784	787	788		
R51	785				
R52	792	850			
R53	793	795	851		

Table 29-1 Correspondence of the patchwork regions and satellite regions for types of A

	patchwork region												satellite region											
	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	47A	52A												
A*01011	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	47A	52A												
A*0106	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	48A	52A												
A*0108	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	47A	53A												
A*3601	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	47A	54A	64A											
A*3602	1A	6A	9A	14A	19A	25A	29A	33A	36A	45A	47A	54A	64A											
A*01012	1A	7A	9A	14A	19A	25A	29A	33A	36A	45A	47A	52A												
A*0102	3A	7A	9A	14A	19A	25A	29A	33A	36A	45A	47A	52A												
A*0107	1A	6A	10A	14A	20A	25A	30A	33A	36A	45A	47A	52A												
A*3002	3A	7A	10A	14A	20A	25A	30A	33A	36A	44A	48A	54A	60A	63A	64A	58A								
A*3009	3A	7A	10A	14A	20A	25A	30A	33A	36A	44A	48A	54A	60A	61A	64A	58A								
A*3003	3A	7A	9A	14A	20A	25A	30A	33A	36A	44A	48A	54A	60A	63A	64A	58A								
A*3004	3A	7A	10A	14A	20A	25A	30A	33A	36A	44A	49A	54A	61A	64A										
A*3006	3A	7A	10A	14A	20A	25A	30A	33A	36A	44A	49A	54A	61A	64A										
A*03011	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A										
A*0304	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A										
A*0308	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A	58A									
A*0305	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A	58A									
A*0306	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A	58A									
A*0307	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A	58A									
A*03013	1A	6A	11A	14A	20A	25A	31A	33A	36A	45A	48A	54A	62A	64A	58A									
A*3103	4A	6A	10A	14A	20A	25A	31A	33A	36A	45A	48A	54A	60A	61A	64A	58A								
A*3104	4A	6A	10A	14A	20A	25A	31A	33A	36A	45A	48A	54A	60A	61A	64A	58A								
A*3001	3A	7A	10A	14A	20A	25A	31A	33A	36A	44A	48A	54A	60A	63A	64A	58A								
A*3008	2A	7A	10A	14A	20A	25A	31A	33A	36A	44A	48A	54A	60A	63A	64A	58A								
A*03012	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	51A	54A	62A	64A	58A									
A*0302	1A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	54A	62A	64A	58A									
A*11011	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*11012	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1102	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1103	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1105	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1106	2A	6A	9A	14A	20A	28A	31A	33A	36A	45A	50A	52A	64A											
A*1107	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1109	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	52A	64A											
A*1104	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	50A	54A	64A											
A*1108	2A	6A	9A	14A	20A	25A	31A	33A	36A	45A	47A	52A	62A	64A										
A*3204	1A	6A	9A	14A	20A	25A	32A	33A	36A	45A	48A	54A	62A	64A	58A									
A*0103	1A	6A	9A	14A	19A	25A	29A	33A	37A	45A	47A	52A												
A*3203	1A	6A	9A	14A	20A	25A	30A	33A	37A	41A	48A	54A	60A	61A	64A									
A*31012	4A	6A	10A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A	58A								
A*3105	4A	6A	10A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A	58A								

Table 29-2

	patchwork region												satellite region											
	4A	6A	10A	14A	21A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A	58A	961	984	1026	1031	1033	1066		
A*3102	1A	6A	9A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	984	1026	1031	1033	1066		
A*7401	1A	6A	9A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	984	1026	1031	1033	1066		
A*7402	1A	6A	9A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	984	1026	1031	1033	1066		
A*7403	1A	6A	9A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	982	984	1026	1031	1033	1066	
A*7405	1A	6A	9A	14A	20A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	960	984	1026	1031	1033	1066	
A*3202	1A	6A	9A	14A	20A	25A	32A	33A	37A	41A	50A	54A	61A	64A			926	984	1026	1031	1033	1066		
A*3201	1A	6A	9A	14A	20A	25A	32A	33A	37A	41A	48A	54A	60A	61A	64A		926	984	1026	1031	1033	1066		
A*3206	1A	6A	9A	14A	20A	25A	32A	33A	37A	41A	48A	54A	61A	64A			926	984	1026	1031	1033	1066		
A*3205	1A	6A	9A	14A	21A	25A	32A	33A	37A	41A	48A	54A	60A	61A	64A		926	950	984	1026	1031	1033	1066	
A*0245	1A	7A	11A	14A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1066						
A*0204	1A	7A	11A	15A	21A	26A	31A	34A	37A	39A	48A	54A	61A	64A			984	1066						
A*02171	1A	7A	11A	15A	21A	26A	31A	35A	37A	39A	48A	54A	61A	64A			984	1004	1066					
A*02172	1A	7A	11A	15A	21A	26A	31A	35A	37A	39A	48A	54A	61A	64A			984	1004	1066					
A*7404	1A	6A	11A	15A	21A	25A	31A	33A	37A	41A	48A	54A	60A	61A	64A		926	984	1026	1031	1033	1066		
A*2408	3A	6A	9A	15A	21A	25A	30A	35A	37A	39A	50A	54A	61A	64A			909	984	1004	1027	1031			
A*02012	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*02013	1A	7A	11A	15A	21A	27A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1035	1066				
A*02014	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*02015	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0209	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0224	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1066						
A*0236	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027						
A*02016	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1027	1066				
A*0207	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1005	1027	1066				
A*0218	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1005	1027	1066				
A*0225	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1005	1027	1066				
A*0226	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1035	1066				
A*0230	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0231	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			909	984	1027	1066				
A*0233	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			927	984	1066					
A*0234	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1005	1027	1066				
A*0239	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			959	984	1027	1066				
A*0240	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1004	1027	1066				
A*0211	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*02201	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*02202	1A	7A	11A	15A	22A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0229	1A	7A	11A	15A	23A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0235	1A	7A	11A	15A	21A	25A	31A	34A	38A	39A	48A	54A	61A	64A			959	984	1027	1066				
A*02011	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	47A	54A	61A	64A			961	984	1027	1066				
A*0242	1A	8A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					
A*0216	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	55A	61A	64A			984	1027	1066					
A*0206	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A			984	1027	1066					

Table 29-3

	patchwork region										satellite region									
	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A	984	1027	1066	1066	1066	1066
A*0241	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A	984	1027	1066			
A*0210	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A	984	1004	1027	1066		
A*0221	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A	924	984	1027	1066		
A*0244	2A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	61A	64A	984	1027	1066			
A*0228	2A	7A	12A	15A	21A	26A	31A	34A	38A	39A	48A	54A	61A	64A	984	1027	1066			
A*0214	2A	7A	11A	15A	21A	26A	31A	35A	38A	39A	48A	54A	61A	64A	984	1027	1066			
A*0205	2A	7A	11A	15A	21A	26A	31A	35A	38A	39A	49A	54A	61A	64A	984	1027	1066			
A*0208	2A	7A	11A	15A	20A	26A	31A	35A	38A	39A	49A	54A	61A	64A	984	1027	1066			
A*0202	1A	7A	11A	15A	21A	26A	31A	35A	38A	39A	49A	54A	61A	64A	984	1027	1066			
A*0247	1A	7A	11A	15A	21A	26A	31A	35A	38A	39A	49A	54A	61A	64A	962	984	1027	1066		
A*0203	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	49A	54A	62A	64A	984	1027	1066			
A*0222	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	49A	54A	61A	64A	984	1027	1066			
A*0212	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	61A	64A	984	1027	1066			
A*0213	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	62A	64A	984	1027	1066			
A*0219	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	61A		984	1027				
A*0227	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	64A		984	1027	1066			
A*0237	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	54A	61A		984	1027				
A*0238	1A	7A	11A	15A	21A	26A	31A	34A	38A	39A	50A	52A	62A	64A	984	1027	1035	1066		
A*2607	2A	6A	9A	15A	21A	25A	29A	33A	38A	41A	49A	52A	62A	64A	1031	1033	1035	1066		
A*3007	3A	7A	10A	16A	21A	25A	30A	33A	36A	44A	48A	54A	57A	58A	919	984	1011	1031	1033	1066
A*8001	1A	7A	13A	16A	20A	28A	29A	33A	36A	45A	49A	55A	58A	60A	1031					
A*2404	3A	6A	9A	16A	21A	25A	29A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027	1027	1031	
A*2301	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	984	1004	1027	1027	1031	1033
A*2303	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	984	1004	1027	1026	1031	1033
A*2304	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	984	1004	1027	1031	1033	1066
A*2305	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	911	984	1004	1027	1031	1033
A*2306	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	983	984	1004	1027	1031	1033
A*2413	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	984	1004	1027	1031		
A*2418	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	48A	54A	57A	58A	984	1004	1027	1031	1056	1066
A*2302	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	49A	54A	57A	58A	984	1004	1027	1031	1033	
A*2406	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	49A	54A	57A	58A	984	1004	1027	1031		
A*2422	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	49A	54A	57A	58A	984	1004	1027	1031	1066	
A*2402101	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027	1031		
A*2402102L	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027	1031		
A*24031	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027	1031	1066	
A*24022	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027			
A*2405	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	984	1004	1027	1031	1033	
A*2407	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	959	984	1004	1027	1031	
A*2415	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	61A	984	1027	1031			
A*2417	3A	6A	9A	16A	21A	25A	30A	35A	37A	45A	50A	54A	57A	58A	984	1004	1027	1027	1031	
A*2420	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	909	984	1004	1027	1031	



Table 29-4

	patchwork region												satellite region											
	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2421	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2425	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	911	984	1004	1027	1031	1031	1031	1031	1031
A*2426	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1010	1031	1031	1031	1031	1031
A*2427	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2429	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2431	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	948	984	1004	1027	1031	1031	1031	1031	1031
A*2432	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2423	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2420	3A	6A	9A	16A	21A	25A	30A	35A	37A	39A	50A	52A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*2416	4A	6A	9A	16A	21A	25A	30A	33A	37A	41A	48A	54A	57A	58A	61A	984	1026	1031	1033	1033	1033	1033	1033	1033
A*2419	3A	6A	9A	16A	21A	25A	31A	35A	37A	39A	50A	54A	57A	58A	61A	959	1004	1027	1031	1031	1031	1031	1031	1031
A*2428	3A	6A	9A	16A	21A	25A	31A	35A	37A	39A	50A	54A	57A	58A	61A	984	1004	1027	1031	1031	1031	1031	1031	1031
A*6810	2A	6A	9A	16A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	959	984	1027	1032	1032	1032	1032	1032	1032
A*6814	2A	6A	9A	16A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	959	984	1027	1032	1032	1032	1032	1032	1032
A*0246	1A	7A	11A	16A	21A	26A	31A	34A	38A	39A	48A	54A	57A	61A	64A	984	1066							
A*0248	1A	7A	9A	16A	21A	25A	31A	34A	38A	39A	48A	54A	57A	61A	64A	984	1066							
A*2414	3A	6A	9A	16A	21A	25A	30A	34A	38A	39A	50A	54A	57A	58A	61A	984	1027	1031	1031	1031	1031	1031	1031	1031
A*3402	2A	6A	9A	17A	20A	25A	31A	33A	36A	45A	48A	54A	58A	62A	64A	949	959	1031	1033	1033	1033	1033	1033	1033
A*3403	2A	6A	9A	17A	20A	25A	31A	33A	36A	45A	48A	54A	58A	62A	64A	949	959	1031	1033	1033	1033	1033	1033	1033
A*2424	3A	6A	9A	17A	20A	25A	30A	35A	37A	39A	48A	54A	58A	60A	61A	949	959	984	1027	1031	1033	1033	1033	1033
A*3301	4A	6A	9A	17A	20A	25A	31A	33A	37A	41A	48A	54A	58A	60A	61A	949	961	984	1026	1031	1033	1033	1033	1033
A*3303	4A	6A	9A	17A	20A	25A	31A	33A	37A	41A	48A	54A	58A	60A	61A	949	961	984	1026	1031	1033	1033	1033	1033
A*3304	4A	6A	9A	17A	20A	25A	31A	33A	37A	41A	48A	54A	58A	60A	61A	949	961	984	1026	1028	1031	1033	1033	1033
A*3305	4A	6A	9A	17A	20A	25A	31A	33A	37A	41A	48A	54A	58A	60A	61A	933	949	961	984	1026	1031	1033	1033	1033
A*3306	4A	6A	9A	17A	20A	25A	31A	33A	37A	41A	48A	54A	58A	60A	61A	932	949	961	984	1026	1031	1033	1033	1033
A*68011	2A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*6804	2A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	961	984	1027	1032	1032	1032	1032	1032
A*6813	2A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	959	984	1027	1032	1032	1032	1032	1032	1032
A*6808	2A	6A	9A	17A	20A	25A	31A	33A	37A	45A	51A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*68012	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*6812	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*6816	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*6817	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1025	1027	1032	1032	1032	1032
A*6819	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*68031	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	984	1027	1032	1032	1032	1032	1032	1032
A*68032	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	49A	54A	58A	61A	64A	908	949	984	1027	1032	1032	1032	1032	1032
A*6806	5A	6A	9A	17A	20A	25A	31A	33A	37A	44A	49A	54A	58A	61A	64A	949	959	984	1011	1027	1032	1032	1032	1032
A*6807	5A	6A	9A	17A	20A	25A	31A	33A	37A	46A	49A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*6805	5A	6A	9A	17A	20A	26A	31A	33A	37A	45A	49A	54A	58A	61A	64A	949	1027	1032	1032	1032	1032	1032	1032	1032
A*6809	5A	6A	9A	17A	20A	25A	31A	33A	37A	45A	50A	54A	58A	61A	64A	949	959	984	1027	1032	1032	1032	1032	1032
A*2501	2A	6A	9A	17A	20A	25A	32A	33A	38A	41A	49A	52A	62A	64A		949	1031	1033	1033	1033	1033	1033	1033	1033

Table 29-5

	patchwork region												satellite region											
	2A	6A	9A	17A	20A	25A	32A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*2502	2A	6A	9A	17A	20A	25A	32A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*2503	1A	6A	9A	17A	20A	25A	32A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2601	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2610	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	1027	1031	1033	1035	1066				
A*2612	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2613	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*2614	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1066						
A*2615	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	925	949	1031	1033	1035	1066				
A*2617	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	985	1031	1033	1035	1066				
A*2608	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	50A	52A	62A	64A	949	1031	1033	1035	1066					
A*2616	3A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2602	2A	6A	9A	17A	20A	25A	29A	33A	38A	44A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2604	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	56A	62A	64A	949	1031	1033	1035	1066					
A*2609	2A	6A	9A	17A	20A	25A	29A	33A	38A	41A	49A	54A	62A	64A	949	1031	1033	1035	1066					
A*2605	2A	6A	9A	17A	20A	25A	30A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2603	2A	6A	9A	17A	20A	26A	31A	33A	38A	41A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*2606	2A	6A	9A	17A	20A	26A	31A	33A	38A	45A	49A	52A	62A	64A	949	1031	1033	1035	1066					
A*6601	2A	6A	9A	17A	20A	25A	31A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*6604	2A	6A	9A	17A	20A	25A	31A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*3401	2A	6A	9A	17A	21A	25A	31A	33A	38A	41A	49A	52A	62A	64A	949	959	1031	1033	1035	1066				
A*6602	2A	6A	9A	17A	20A	25A	31A	33A	38A	41A	49A	55A	62A	64A	949	959	1031	1033	1035	1066				
A*6603	2A	6A	9A	17A	20A	25A	31A	33A	38A	41A	49A	55A	62A	64A	949	959	984	1031	1033	1035	1066			
A*6802	2A	6A	9A	17A	20A	25A	31A	33A	38A	39A	49A	54A	61A	64A	949	984	1031	1033	1035	1066				
A*6815	2A	6A	9A	17A	20A	26A	31A	33A	38A	39A	49A	54A	61A	64A	949	959	984	1027	1032	1066				
A*6901	2A	6A	9A	17A	20A	25A	31A	34A	38A	39A	48A	54A	58A	61A	64A	949	959	984	1027	1032	1066			
A*2901	4A	6A	9A	18A	20A	25A	29A	33A	37A	45A	48A	54A	58A	60A	61A	926	948	959	984	1006	1026	1031	1033	1066
A*2902	4A	6A	9A	18A	20A	25A	29A	33A	37A	45A	48A	54A	58A	60A	61A	926	948	959	984	1026	1031	1033	1066	
A*2903	4A	6A	9A	18A	20A	25A	29A	33A	37A	45A	48A	54A	58A	60A	61A	926	948	959	984	1026	1031	1033	1066	
A*2904	4A	6A	9A	18A	24A	25A	29A	33A	37A	45A	48A	54A	58A	60A	61A	926	948	959	984	1026	1031	1033	1066	
A*4301	2A	6A	9A	18A	20A	25A	29A	33A	38A	41A	49A	52A	64A		948	1066								

Table 30 Correspondence of the patchworks and SEQ ID Nos for A

patchwork	SEQ ID NO:					
1A	912					
2A	913	917				
3A	914	918				
4A	915					
5A	916					
6A	921					
7A	922					
8A	923					
9A	934	939				
10A	935	950				
11A	936					
12A	937					
13A	938					
14A	941					
15A	942	946				
16A	943					
17A	944	947				
18A	945					
19A	952					
20A	953					
21A	954	958				
22A	955					
23A	956					
24A	957					
25A	963	967	969	971		
26A	964	968	970			
27A	965					
28A	966					
29A	972	976				
30A	973	977	979	981		
31A	974	978	980			
32A	975					
33A	986	989	991			
34A	987					
35A	988	990				
36A	992					
37A	993	995	997	999		
38A	994	996	998	1000	1001	1002
39A	1012	1020				
40A	1013	1021				
41A	1014					
42A	1015	1022				
43A	1016					
44A	1017	1023				

patchwork	SEQ ID NO:					
45A	1018	1024				
46A	1019					
47A	1049	1054				
48A	1050					
49A	1051					
50A	1052					
51A	1053					
52A	1058	1063				
53A	1059					
54A	1060	1064	1065			
55A	1061					
56A	1062					
57A	950	951				
58A	1007	1008				
59A	1030	1041				
60A	1036	1042	1046	1048		
61A	1038	1043	1047			
62A	1039	1044				
63A	1040	1045				
64A	1067	1071				

[illegible]

Table 31-2

	patchwork region																		satellite region									
	28	78	128	158	218	268	308	348	418	478	518	538	548	568	578	588	618	628	1184	1201	1233	1263	1287	1272	1283			
B*51022	28	78	128	158	218	268	308	348	418	478	518	538	548	568	578	588	618	628	1184	1201	1233	1263	1287	1272	1283			
B*5105	28	78	128	158	218	268	308	348	418	478	518	538	548	568	578	588	618	628	1184	1201	1233	1263	1287	1272	1283			
B*5115	28	78	128	158	218	268	308	358	438	478	518	538	548	568	578	618	628		1184	1201	1233	1267	1272	1285				
B*5203	28	78	128	158	228	268	298	338	438	478	518	538	548	578	588	598	628		1184	1201	1232	1242	1267	1272	1285			
B*5801	28	78	128	188	218	268	298	338	438	478	518	528	548	568	578	588	598	628	1184	1191	1197	1199	1204	1232	1242			
B*5804	28	78	128	188	218	268	298	338	438	478	518	528	548	568	578	588	598	628	1184	1192	1197	1199	1204	1232	1242			
B*5805	28	78	128	188	218	268	298	338	438	478	518	528	548	568	578	588	598	628	1184	1191	1197	1199	1204	1232	1242			
B*5802	28	78	128	188	218	268	318	388	438	478	518	528	548	568	578	588	598	628	1184	1191	1197	1199	1204	1242	1267			
B*5806	28	78	128	188	218	268	318	388	438	478	518	528	548	568	578	588	598	628	1184	1191	1197	1199	1204	1242	1267			
B*53520	28	78	128	168	208	248	298	368	438	478	518	538	548	568	578	588	598	628	1184	1232	1242	1267	1272	1285				
B*53578	28	78	128	168	208	248	298	368	438	478	518	528	538	548	568	578	588	628	1184	1201	1232	1242	1267	1272	1285			
B*7805	28	78	128	168	208	248	308	348	438	478	518	528	538	548	618	628		1184	1201	1233	1263	1267	1272	1283				
B*52011	28	78	128	168	218	268	308	348	438	478	518	528	538	548	568	578	588	618	628	1184	1201	1233	1263	1267	1272			
B*52013	28	78	128	168	218	268	308	348	438	478	518	528	538	548	568	578	588	618	628	1184	1201	1233	1263	1267	1272			
B*33226	28	78	98	178	208	248	298	368	438	478	518	538	548	568	578	588	598	628	1184	1189	1201	1232	1242	1267	1272			
B*53504	28	78	98	148	208	248	288	348	438	478	518	538	548	568	578	588	598	628	1285									
B*5501	28	78	98	148	208	248	308	358	438	478	518	528	548	568	578	588	598	628	1233	1267	1272							
B*5502	28	78	98	148	208	248	308	358	438	478	518	528	548	568	578	588	598	628	1233	1267	1272	1285						
B*5503	28	78	98	148	208	248	308	358	438	478	518	528	548	568	578	588	598	628	1233	1267	1272							
B*5505	28	78	98	148	208	248	308	358	438	478	518	528	548	568	578	588	598	628	1187	1233	1267	1272						
B*5601	28	78	98	148	208	248	308	358	438	478	518	528	548	568	578	588	598	628	1233	1267	1272	1285						
B*5509	28	78	98	148	208	248	308	358	418	458	508	518	528					1287										
B*5603	28	78	98	148	208	248	298	368	448	478	518							1287										
B*5508	28	78	98	148	208	248	298	348	438	478	508	618						1285										
B*5602	28	78	98	148	208	248	298	358	438	478	508	618	628					1267	1272	1285								
B*5604	28	78	98	148	208	248	298	358	438	478	508	618	628					1267	1272	1285								
B*5607	28	78	98	148	218	258	308	358	438	478	508	578	568	618	628			1233	1267	1272	1285							
B*5901	28	78	98	158	218	268	308	358	438	468	508	538	548	568	578	588	598	618	628	1201	1233	1267	1272	1285				
B*4601	28	78	118	148	208	248	298	368	448	478	518	528	558	628				1181	1184	1202	1209	1267						
B*4602	28	78	118	148	208	248	298	368	448	478	518	528	558	628				1181	1184	1201	1267	1297						
B*15111	28	78	118	148	208	248	298	368	448	478	538	548	628	648				1181	1184	1201	1267	1297						
B*15112	28	78	118	148	208	248	298	368	448	478	538	548	628	648				1181	1184	1182	1201	1267	1297					
B*5701	28	78	118	188	218	268	338	368	438	478	528	548	568	578	628			1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*5704	28	78	118	188	218	268	338	368	418	478	528	548	568	578	608	628		1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*5702	28	78	118	188	218	268	338	348	418	478	528	548	568	578	618	628		1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*57031	28	78	118	188	218	268	338	348	438	478	528	548	568	578	618	628		1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*57032	28	78	118	188	218	268	338	348	438	478	528	548	568	578	618	628		1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*5705	28	78	118	188	218	268	298	368	438	478	528	548	568	578	618			1181	1184	1191	1197	1199	1204	1232	1267	1272	1285	
B*1516	28	78	118	188	218	268	298	368	438	478	528	548	568	578	608	618	628		1181	1184	1191	1197	1199	1204	1232	1267	1285	
B*1517	28	78	118	188	218	268	298	368	438	478	528	548	568	578	628	648		1181	1184	1199	1204	1233	1267	1297				
B*5706	28	78	118	188	218	268	308	358	438	478	528	548	568	578	628			1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*5707	28	78	118	188	218	268	308	348	438	478	528	548	568	578	618	628		1181	1184	1191	1197	1199	1204	1232	1267	1285		
B*1508	28	78	118	158	208	248	298	368	448	478	538	548	628	648				1181	1184	1201	1267	1297						
B*1556	28	78	118	158	208	248	298	368	438	478	538	548	628	648				1181	1184	1201	1267	1297						
B*1521	28	78	118	178	208	248	298	368	438	478	538	548	608	628	648			1181	1184	1201	1232	1267	1297					
B*1544	28	78	118	178	208	248	298	368	438	468	538	548	568	608	628	648		1181	1184	1201	1232	1267	1297					

id	patchwork region										id	satellite region									
	28 78	118	168	218	268	318	368	418	478	538		588	638	688	738	788	838	888	938	988	
B*1513	28 78	118	168	218	268	318	368	418	478	538	588	638	688	738	788	838	888	938	988		
B*1524	28 78	118	168	218	268	318	368	418	478	538	588	638	688	738	788	838	888	938	988		
B*1536	28 78	118	168	218	268	318	368	418	478	538	588	638	688	738	788	838	888	938	988		
B*1567	28 78	118	168	218	268	318	368	418	478	538	588	638	688	738	788	838	888	938	988		
B*1504	28 78	118	168	208	248	308	368	448	478	528	588	648	688	738	788	838	888	938	988		
B*1535	28 78	118	168	208	248	308	368	448	478	528	588	648	688	738	788	838	888	938	988		
B*1542	28 78	118	168	208	248	308	368	448	478	528	588	648	688	738	788	838	888	938	988		
B*1530	28 78	118	168	208	248	298	348	448	478	528	588	648	688	738	788	838	888	938	988		
B*1563	28 78	118	168	208	248	298	348	448	478	528	588	648	688	738	788	838	888	938	988		
B*1546	28 78	118	168	208	248	298	348	438	478	528	588	648	688	738	788	838	888	938	988		
B*4021	28 78	118	168	208	248	298	348	438	478	528	588	648	688	738	788	838	888	938	988		
B*1527	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1532	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1515	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1501101	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1512	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1519	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*15012	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*15013	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*15014	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1514	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1528	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888	938	988		
B*1533	28 78	118	168	208	248	298	348	448	478	538	588	648	688	738	788	838	888</				



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patchwork region																satellite region										
B-40012	28	68	138	168	208	248	288	348	438	458	498	508	528	538	548	618							1178	1184	1201	1285
B-40033	28	68	138	168	208	248	288	348	438	458	498	508	528	538	548								1178	1184	1201	1285
B-40014	28	68	138	168	208	248	288	348	438	458	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4025	28	68	138	168	208	248	288	348	438	458	498	508	528	538	548	618							1178	1184	1201	1285
B-4023	28	68	138	168	208	248	288	348	418	458	498	508	528	538	548	618							1178	1184	1201	1285
B-4101	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1173	1178	1184	1201
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4101	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4107	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4109	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4102	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4103	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548	618	628						1178	1184	1201	1285
B-4105	28	68	138	168	208	248	288	348	428	468	498	508	528	538	548											

Table 31-5

	patchwork region												satellite region											
B*4701	28	58	138	168	218	258	298	368	438	498	508	538	548	578	1178	1184	1201	1233	1267	1285				
B*4007	28	58	138	158	208	248	288	348	438	458	498	508	528	538	548	1178	1184	1201	1285					
B*4072	28	58	138	168	218	258	298	368	428	478	508	528	538	548	568	1178	1184	1201	1232	1267	1272	1285	1292	
B*4408	28	58	118	168	218	258	298	368	428	478	508	528	538	548	568	1181	1184	1201	1232	1267	1272	1285	1292	
B*1301	28	58	118	168	218	258	298	358	438	468	518	528	538	548	568	1178	1184	1201	1232	1267	1272	1285	1297	
B*1306	28	58	118	168	218	258	298	358	438	468	518	528	538	548	568	1178	1184	1201	1232	1267	1272	1285	1297	
B*1302	28	58	118	168	218	258	308	358	438	468	518	528	538	548	568	1178	1184	1201	1233	1267	1272	1285	1297	
B*1303	28	58	118	168	218	258	308	358	438	478	518	528	538	548	568	1178	1184	1201	1233	1267	1272	1285	1297	
B*1304	28	58	118	168	218	258	308	368	438	478	518	528	538	548	568	1178	1184	1201	1233	1267	1272	1285	1297	
B*0802	28	58	98	158	218	258	288	348	428	468	508	538	568	618	628	1171	1201	1272	1285	1296				
B*0808	28	58	98	158	218	248	288	348	418	468	508	538	618			1171	1201	1272	1285	1296				
B*0803	28	58	98	158	218	268	288	348	428	468	508	538	548	568	618	1201	1232	1242	1267	1272	1285			
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B*0812	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0801	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0807	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0805	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0810	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0811	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0813	28	58	98	158	208	248	288	348	428	468	508	538	618	628		1171	1201	1272	1285	1296				
B*0809	28	58	98	158	208	248	308	348	428	468	508	538	598	618	628	1201	1267	1297						
B*1529	28	58	98	158	208	248	288	348	438	478	508	538	548	628	648	1171	1201	1272	1285	1296				
B*0804	28	58	98	168	208	248	288	348	428	468	508	538	628			1171	1201	1272	1285	1296				
B*4012	28	58	98	168	208	248	298	348	438	478	508	528	538	548	618	1184	1201	1267	1297					
B*1503	28	58	98	168	208	248	298	348	438	478	508	528	538	548	628	1201	1267	1297						
B*1504	28	58	98	168	208	248	298	348	438	478	508	538	548	628	648	1201	1267	1297						
B*1561	28	58	98	168	208	248	298	348	438	478	508	528	538	628	648	1201	1267	1297						
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B*1551	28	58	98	178	208	248	298	348	438	478	508	538	548	628	648	1201	1267	1297						
B*1552	28	58	98	178	208	248	298	348	438	478	508	538	548	628	648	1201	1267	1297						
B*1523	28	58	98	178	218	268	298	348	438	478	508	538	548	568	578	628	1201	1267	1297					
B*8307	28	58	98	148	208	248	298	348	428	478	508	628				1232	1267	1272	1285	1292				
B*5606	28	58	128	148	208	248	308	348	438	478	518	538	618	628		1184	1233	1263	1267	1272	1293			
B*7801	28	58	128	158	208	248	308	348	438	478	518	538	548	618	628	1184	1201	1233	1263	1267	1272	1293		
B*7802	28	58	128	158	208	248	308	348	438	478	518	538	548	568	578	598	618	1201	1233	1263	1267	1272	1293	
B*5306	28	58	128	158	218	268	298	348	438	478	518	538	548	568	578	608	628	1184	1201	1232	1267	1272	1293	
B*4406	28	58	128	158	218	268	298	348	438	478	518	538	548	568	578	608	628	1184	1201	1232	1267	1272	1293	
B*5104	28	58	128	158	218	268	298	348	438	478	518	538	548	568	578	608	628	1184	1201	1232	1267	1272	1293	



[illegible]

[illegible]

[illegible]

[illegible]

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Table 32

Correspondence of the patchworks and SEQ ID Nos for B										
patchwork	SEQ ID NO:									
1B	1080									
2B	1081									
3B	1082									
4B	1083									
5B	1084									
6B	1085	1088								
7B	1086									
8B	1087									
9B	1089	1094								
10B	1090									
11B	1091	1095								
12B	1092	1096								
13B	1093									
14B	1097	1103	1106							
15B	1098	1104								
16B	1099									
17B	1100	1105	1107	1108						
18B	1101									
19B	1102									
20B	1109	1113	1115							
21B	1110	1114								
22B	1111									
23B	1112									
24B	1116	1120								
25B	1117	1121	1122							
26B	1118									
27B	1119									
28B	1123	1129	1133							
29B	1124	1130	1134	1135	1136	1137	1138	1139	1140	1141
30B	1125	1131								
31B	1126									
32B	1127	1132								
33B	1128									
34B	1142	1149	1153	1156	1157					
35B	1143	1150	1154							
36B	1144	1151								

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Table 32 (continued)

Correspondence of the patchworks and SEQ ID Nos for B										
patchwork	SEQ ID NO:									
37B	1145									
38B	1146									
39B	1147									
40B	1148	1152	1155							
41B	1158	1162								
42B	1159									
43B	1160	1163	1164							
44B	1161									
45B	1165									
46B	1166									
47B	1167	1169								
48B	1168									
49B	1170	1179								
50B	1175	1180								
51B	1183	1212	1218	1222						
52B	1195	1213	1219	1223	1226					
53B	1206	1215								
54B	1209	1216	1220	1224						
55B	1211	1217	1221	1225						
56B	1227	1246								
57B	1229	1247	1251	1253	1255	1256				
58B	1239	1249	1252	1254						
59B	1242	1250								
60B	1259	1274	1277							
61B	1261	1275	1278	1279	1280	1281	1282	1283	1284	
62B	1269	1276								
63B	1288	1295								
64B	1296	1299								

Table 33.

Correspondence of Primers		
	SEQ ID NOS.	SEQ ID NOS.
Primers for DRB1	590, 591, 591	593
Primers for DPB1	448, 449	450-455
Primers for DQB1	504, 505	506
Primers for A	899, 900, 903-905	901, 902, 906, 907
Primers for B	1073, 1075-1077	1074, 1078, 1079

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[0084]

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plantation, Tissue Antigen, 39: 225, 1992
- 10 (3) Inoko, H. et al.: PCR-RFLP, Handbook of HLA typing techniques (edited by Hui, K.M. & Bidwell, J.L.), CRC press, Florida, U.S.A., 1993, p.9
- (4) Erlich, H. et al.: HLA-DR, -DQ and -DP typing using PCR amplification and immobilized probes, European Journal of Immunogenetics, 18: 33, 1991
- 15 (5) Carrington, M. et al.: Typing of HLA-DQA1 and DQB1 using DNA single-strand conformation polymorphism, Hum. Immunol., 33: 208, 1992

Industrial Applicability

- 20 [0085] According to the present invention, there are provided a kit and method that are suitable for processing of a large number of specimens and enable a large number of high accuracy typing tests by one test for one specimen, and oligonucleotides and primers used therefor.

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SEQUENCE LISTING

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<110> NISSHINBO INDUSTRIES. INC.  
SYSTEM RESEARCH INC.

10

<120> KIT AND METHOD FOR DETERMINING HLA TYPES

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18

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       cagaagcggg gccaggt 17

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5 <210> 848  
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25 <210> 871  
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35 <210> 872  
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15       <210> 891  
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25       <210> 892  
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           <212> DNA  
           <213> Artificial Sequence

          <220>  
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           gacgactact gcagata 17

35       <210> 893  
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          <220>  
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           gacaactaat gcagaca 17

45       <210> 894  
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           <212> DNA  
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          <220>  
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           acaattacag ggttttt 17

55       <210> 895  
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<212> DNA  
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 55 <213> Artificial Sequence

<220>  
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	<212> DNA	
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20	<220>	
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	<211> 17	
	<212> DNA	
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gtgcgggtttg acagcga

<210> 927

$\langle 211 \rangle$  17

$\langle 212 \rangle$  DNA

<213> Artificial Sequence

 $\langle 220 \rangle$ 

<223> Description of Artificial Sequence:capture

<400> 927

cgacgccggg agccaga

<210> 928

$\langle 211 \rangle$	17
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$\langle 212 \rangle$  DNA

### 〈213〉 Artificial Sequence

 $\langle 220 \rangle$ 

<223> Description of Artificial Sequence:capture

<400> 928

g c g a g c c a g a   a g a t g g a

<210> 929

$\langle 211 \rangle$  17

$\langle 212 \rangle$  DNA

<213> Artificial Sequence

 $\langle 220 \rangle$ 

<223> Description of Artificial Sequence:capture

&lt;400&gt; 929

gcgagccaga ggaaggga

<210> 930

<211> 17

$\langle 212 \rangle$  DNA

### 〈213〉 Artificial Sequence

 $\langle 220 \rangle$ 

<223> Description of Artificial Sequence:capture

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g c g a g c c g g a   g g a t g g a

<210> 931

$\langle 211 \rangle$	17
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$\langle 212 \rangle$  DNA

### <213> Artificial Sequence

 $\langle 220 \rangle$ 

<223> Description of Artificial Sequence:capture

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gggagccaga gga t gga

<210> 932



<211> 17  
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**TO**

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17

15

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**25**

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 $\langle 220 \rangle$ 

30

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17

35

$\langle 212 \rangle$  DNA

 $\langle 220 \rangle$ 

40

ggcgggcccg! cgggagg

17

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$\langle 212 \rangle$  DNA

 $\langle 220 \rangle$ 

50

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17

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 55





17

17

17

17

17

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35

40

45

50

55

## Claims

1. A typing kit for determining HLA genotype of a test specimen by hybridization between a nucleic acid sequence derived from the test specimen and oligonucleotides, which comprises a substrate on which the oligonucleotides are immobilized through covalent bonds, wherein the oligonucleotides are 10-24 nucleotide length and are derived from sequences of a group of genes belonging to HLA class I or class II antigen on a human genome and each of the oligonucleotides includes polymorphism of each gene as alloantigen in the sequence.
2. The typing kit according to claim 1, wherein a surface of the substrate is coated with carbodiimide groups or isocyanate groups and the covalent bonds are formed through reactions of the carbodiimide groups or isocyanate groups and linkers added to ends of the oligonucleotides.
3. The typing kit according to claim 1, wherein the linker is an amino group, or a compound having an amino group or a homopolymer of thymidine residues at an end of the compound.
4. The typing kit according to claim 1, wherein the oligonucleotides are immobilized in an area on a surface of the substrate having a size of 10-1,000  $\mu\text{m}$  in diameter.
5. The typing kit according to claim 1, wherein the oligonucleotides consist of DNA or a peptide nucleic acid.
6. The typing kit according to claim 1, wherein class I antigen is an antigen controlled by any of gene loci coding for HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G and class II antigen is an antigen controlled by any of gene loci coding for HLA-DQ, HLA-DR or HLA-DP.
7. The typing kit according to claim 1 or 6, wherein HLA-DQ is an antigen derived from any of DQA1, DQA2, DQB1 and DQB2 gene loci.
8. The typing kit according to claim 1 or 6, wherein HLA-DR is an antigen derived from any of DRA, DRB1, DRB3, DRB4 and DRB5 gene loci.
9. The typing kit according to claim 1 or 6, wherein HLA-DP is an antigen derived from any of DPA1, DPA2, DPB1 and DPB2 gene loci.
10. The typing kit according to claim 1 or 6, wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298.
11. The typing kit according to any one of claims 1, 6 and 7, which is for determining HLA-DQA1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 1-54.
12. The typing kit according to any one of claims 1, 6 and 7, which is for determining HLA-DQB1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 55-140 or 507-589.
13. The typing kit according to any one of claims 1, 6 and 8, which is for determining HLA-DRA genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 141-144.
14. The typing kit according to any one of claims 1, 6 and 8, which is for determining genotypes of HLA-DRB1, HLA-DRB3, HLA-DRB4, HLA-DRB5, HLA-DRB6 or HLA-DRB7, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 145-323 or 594-853.
15. The typing kit according to any one of claims 1, 6 and 9, which is for determining HLA-DPA1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 324-348.
16. The typing kit according to any one of claims 1, 6 and 9, which is for determining HLA-DPB1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 349-397 or 456-503.
17. The typing kit according to claim 10, wherein at least one of the oligonucleotides is replaced with an oligonucleotide of 8-24 nucleotide length obtained by extending or shortening any of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298 for a gene sequence on the genome at 5' or 3' end or

at both ends without eliminating or changing nucleotides associated with the gene polymorphism to have optimized binding affinity for the hybridization.

18. The typing kit according to any one of claims 1, 2, 4, 5 and 10-17, wherein at least one of the oligonucleotides is an oligonucleotide whose binding affinity for the hybridization is reduced by replacing an arbitrary nucleotide not involved in the gene polymorphism with a spacer compound.
19. The typing kit according to claim 18, wherein the spacer compound has a nucleic acid frame that does not have complementary binding property with any kind of nucleotides.
20. PCR primers for excising and amplifying a nucleic acid sequence associated with gene polymorphism of HLA class I antigen or class II antigen of a test specimen.
21. The PCR primers according to claim 20, which is for low accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQ consists of at least one of (SEQ ID NOS: 398 and 400) and (SEQ ID NOS: 399 and 400), and a combination of 5' primer and 3' primer corresponding to HLA-DR consists of at least one of (SEQ ID NOS: 401 and 403) and (SEQ ID NOS: 402 and 403).
22. The PCR primers according to claim 20, which is for high accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQB1 consists of at least one of (SEQ ID NOS: 404 and 406), (SEQ ID NOS: 405 and 406), (SEQ ID NOS: 407 and 409), (SEQ ID NOS: 408 and 409), (SEQ ID NOS: 410 and 412) and (SEQ ID NOS: 411 and 412), and a combination of 5' primer and 3' primer corresponding to HLA-DRB1 consists of at least one of (SEQ ID NOS: 413 and 417), (SEQ ID NOS: 414 and 417), (SEQ ID NOS: 415 and 417) and (SEQ ID NOS: 416 and 417).
23. The PCR primers according to claim 20, which is for high accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQA1 consists of at least one of (SEQ ID NOS: 418 and 420) and (SEQ ID NOS: 419 and 420), a combination of 5' primer and 3' primer corresponding to HLA-DQB1 is (SEQ ID NOS: 421 and 422), a combination of 5' primer and 3' primer corresponding to HLA-DRA is (SEQ ID NOS: 423 and 424), a combination of 5' primer and 3' primer corresponding to HLA-DRB2 consists of at least one of (SEQ ID NOS: 425 and 428), (SEQ ID NOS: 426 and 428) and (SEQ ID NOS: 427 and 428), a combination of 5' primer and 3' primer corresponding to HLA-DRB3 consists of at least one of (SEQ ID NOS: 429 and 431) and (SEQ ID NOS: 430 and 431), a combination of 5' primer and 3' primer corresponding to HLA-DRB4 consists of at least one of (SEQ ID NOS: 432 and 433) and (SEQ ID NOS: 434 and 435), a combination of 5' primer and 3' primer corresponding to HLA-DRB5 is (SEQ ID NOS: 436 and 437), a combination of 5' primer and 3' primer corresponding to HLA-DRB6 consists of at least one of (SEQ ID NOS: 438 and 439) and (SEQ ID NOS: 439 and 440), and a combination of 5' primer and 3' primer corresponding to HLA-DRB7 is (SEQ ID NOS: 441 and 442), a combination of 5' primer and 3' primer corresponding to HLA-DPA1 is (SEQ ID NOS: 443 and 444) and a combination of 5' primer and 3' primer corresponding to HLA-DPB1 consists of at least one of (SEQ ID NOS: 445 and 446) and (SEQ ID NOS: 445 and 447).
24. A method for determining HLA genotype of a test specimen, which comprises allowing hybridization of the oligonucleotides on the substrate of the typing kit according to any one of claims 1-16 with a nucleic acid sequence derived from the specimen and detecting occurrence of hybridization of the oligonucleotides and the nucleic acid sequence derived from the specimen.
25. The method for determining HLA genotype of a test specimen according to claim 24, comprising the steps of:
  - carrying out low accuracy typing of HLA genotype of the specimen by performing first PCR amplification using the primers for low accuracy genotyping according to claim 21 and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the typing kit according to any one of claims 1-16, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides; and
  - carrying out high accuracy HLA genotyping of the specimen by performing second PCR amplification based on the above determination result using primers appropriately selected from the primers for high accuracy genotyping according to claim 22 and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the typing kit according to any one of claims 1-16, and detecting occurrence of hybridization of the nucleic acid sequence derived from



the specimen and each of the oligonucleotides.

26. The method for determining HLA genotype of a test specimen according to claim 24, wherein PCR amplification is performed by using a nucleic acid sequence derived from the test specimen as a template and the primers for high accuracy genotyping according to claim 24 (22 or 23?) and the amplification product is hybridized with each of the oligonucleotides contained in the typing kit according to any one of claims 1-16.
27. The method for determining HLA genotype of a test specimen according to claim 24, which comprises preparing alignment of gene sequences of each HLA, and setting a nucleotide sequence in which at least two nucleotide polymorphisms or sequence polymorphisms involving the HLA typing are observed in a nucleotide sequence consisting of 1-10 nucleotides as a patchwork segment, and/or setting a nucleotide sequence in which at least one nucleotide polymorphism or sequence polymorphism is observed as a satellite segment, and finding the patchworks and/or the satellites in gene sequences of all of the HLA genes, performing typing by combination of the patchworks and/or the satellites and judging whether each of HLA typing of the test specimen is homozygote or heterozygote together with determining the types of HLA.
28. The method for determining HLA genotype of a test specimen according to claim 27, wherein a pseudogene of DRB1 is included in the HLA types to be determined.
29. The typing kit according to claim 1 or 6, wherein the oligonucleotides comprises at least one of the nucleotide sequences of SEQ ID NOS: 908-1071, and the kit is for determining HLA-A genotype.
30. The typing kit according to claim 1 or 6, wherein the oligonucleotides comprises at least one of the nucleotide sequences of SEQ ID NOS: 1080-1298, and the kit is for determining HLA-DRA genotype.

Fig. 1

DQA1

B	1	2	3	4	5	6	7	8	9	10	B
	11	12	13	14	15	16	17	18	19	20	
	21	22	23	24	25	26	27	28	29	30	
	31	32	33	34	35	36	37	38	39	40	
	41	42	43	44	45	46	47	48	49	50	
B	51	52	53	54							B

Fig. 2

DQB1(low resolution)

B	55	56	57	58							B
---	----	----	----	----	--	--	--	--	--	--	---

DQB1(high resolution)

B	59	60	61	62	63	64	65	66	67	68	B
	69	70	71	72	73	74	75	76	77	78	
	79	80	81	82	83	84	85	86	87	88	
	89	90	91	92	93	94	95	96	97	98	
	99	100	101	102	103	104	105	106	107	108	
	109	110	111	112	113	114	115	116	117	118	
	119	120	121	122	123	124	125	126	127	128	
	129	130	131	132	133	134	135	136	137	138	
B	139	140									B

Fig. 3

DRA

B	141	142	143	144
---	-----	-----	-----	-----

B
---

Fig. 4

DRB1(low resolution)

B	145	146	147	148	149	150	151	152	153	154	B
B	155	156									B

DRB1(high resolution)

B	157	158	159	160	161	162	163	164	165	166	B
	167	168	169	170	171	172	173	174	175	176	
	177	178	179	180	181	182	183	184	185	186	
	187	188	189	190	191	192	193	194	195	196	
	197	198	199	200	201	202	203	204	205	206	
	207	208	209	210	211	212	213	214	215	216	
	217	218	219	220	221	222	223	224	225	226	
	227	228	229	230	231	232	233	234	235	236	
	237	238	239	240	241	242	243	244	245	246	
B	247	248	249	250							B

Fig. 5

DRB3, DRB4, DRB5, DRB6 (high resolution)

B	251	252	253	254	255	256	257	258	259	260	B
	261	262	263	264	265	266	267	268	269	270	
	271	272	273	274	275	276	277	278	279	280	
	281	282	283	284	285	286	287	288	289	290	
	291	292	293	294	295	296	297	298	299	300	
	301	302	303	304	305	306	307	308	309	310	
	311	312	313	314	315	316	317	318	319	320	
B	321	322	323								B

Fig. 6

DPA1

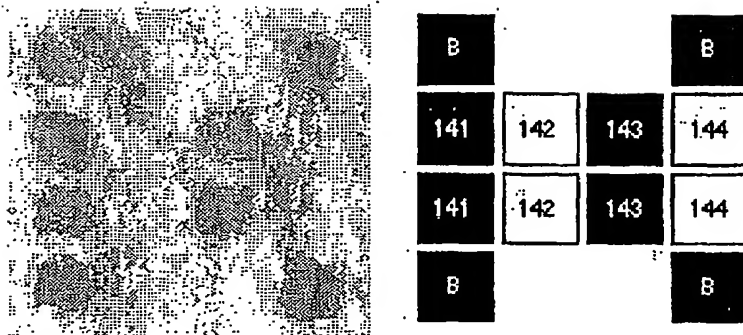
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	334	335	336	337	338	339	340	341	342	343	
B	344	345	346	347	348						B

Fig. 7

DPB1

B	349	350	351	352	353	354	355	356	357	358	B
	359	360	361	362	363	364	365	366	367	368	
	369	370	371	372	373	374	375	376	377	378	
	379	380	381	382	383	384	385	386	387	388	
B	389	390	391	392	393	394	395	396	397		B

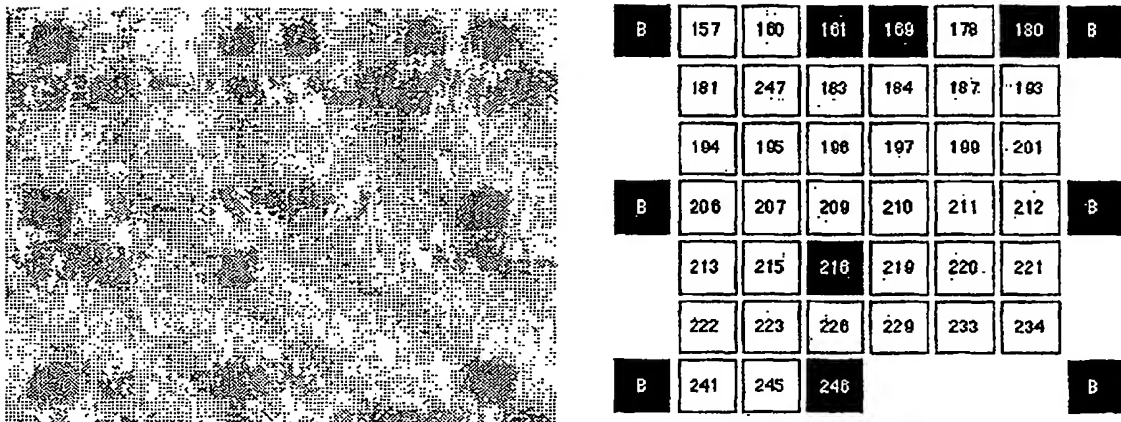
*Fig. 8*



*Fig. 9*



*Fig. 10*



BNSDOCID: <EP\_\_\_\_\_1291440A1\_I\_>

[illegible]

Fig.12

	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
B	507	510	513	517	520	522	524		533	536	537	538	540	543	544
B	508	511	514	518	521	523	525		534			539	541		
B	509	512	515	519			526	531	535				542		
B			516				527								
B							528	532							
B							529								
B							530								
	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
B	545	546	547	548		559				570	572	574		580	586
B				549		560				571	573	575		581	587
B				550		561	565	568	569			576		582	588
B				551		562	566					577	579	583	589
B				552		563	567					578		584	
B				553		564								585	
B				554	557										
B				555	558										
B				556											

324



B	B	B	B	B
				799
795	796	797	798	

Fig. 15

[illegible]

[illegible][illegible][illegible]

Fig. 17-1

	B	B	B	B	B	B	B	B	B	B	B	B	B
B	1080	1084		1089	1094	1097	1103	1106		1109	1113	1115	1116
B	1081	1085	1088	1090		1098	1104			1110	1114		1117
B	1082	1086		1091	1095	1099				1111			1118
B	1083	1087		1092	1096	1100	1105	1107	1108	1112			1119
B				1093		1101							
B						1102							
B													
	B	B	B	B	B	B	B	B	B	B	B	B	B
B	1170	1179	1181					1196				1227	1246
B	1171		1182					1197				1228	
B	1172		1183	1212	1218	1222		1198				1229	1247
B	1173		1184					1199	1214			1230	
B	1174		1185					1200				1231	
B	1175	1180	1186					1201				1232	1248
B	1176		1187					1202				1233	
B	1177		1188					1203				1234	
B	1178		1189					1204				1235	
B			1190					1205				1236	
B			1191					1206	1215			1237	
B			1192					1207				1238	
B			1193					1208				1239	1249
B			1194					1209	1216	1220	1224	1240	
B			1195	1213	1219	1223	1226	1210				1241	
B								1211	1217	1221	1225	1242	1250
B												1243	
B												1244	
B												1245	

Fig. 17-2

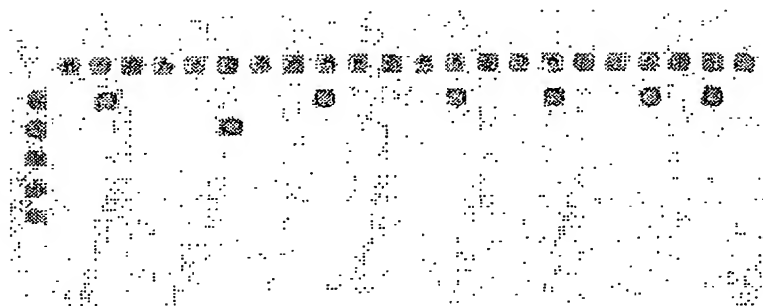
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		1125	1131									1144	1151
		1126										1145	
		1127	1132									1146	
		1128										1147	
												1148	1152
B	B	B	B	B	B	B	B	B	B	B	B	B	B
				1257									1285
				1258									1286
1251	1253	1255	1256	1259	1274	1277							1287
				1260									1288
				1261	1275	1278	1279	1280	1281	1282	1283	1284	1289
				1262									1290
				1263									1291
				1264									1292
				1265									1293
				1266									1294
				1267									
				1268									
1252	1254			1269	1276								
				1270									
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				1272									
				1273									

330

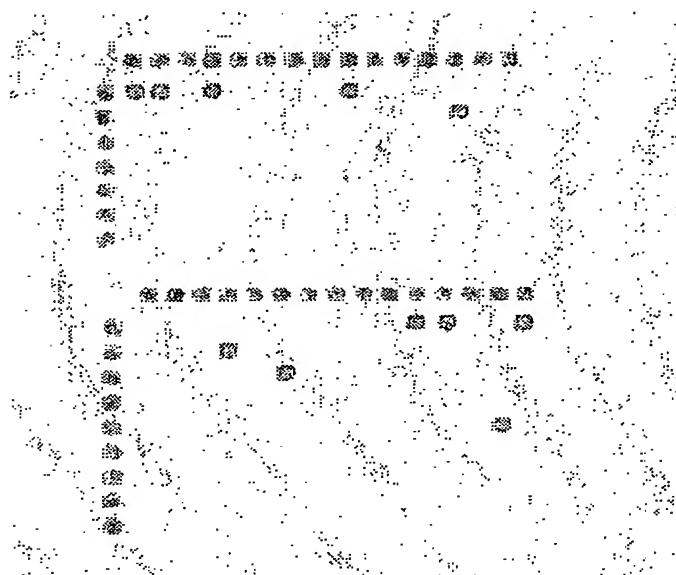
Fig.19A

	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
B	507	510	513	517	520	522	524		533	536	537	538	540	543	544
B	508	511	514	518	521	523	525		534			539	541		
B	509	512	515	519			526	531	535				542		
B			516				527								
B							528	532							
B							529								
B							530								
	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
B	545	546	547	548		559				570	572	574		580	586
B				549		560				571	573	575		581	587
B				550		561	565	568	569			576		582	588
B				551		562	566					577	579	583	589
B				552		563	567					578		584	
B				553		564								585	
B				554	557										
B				555	558										
B				556											

*Fig.18B*



*Fig.19B*





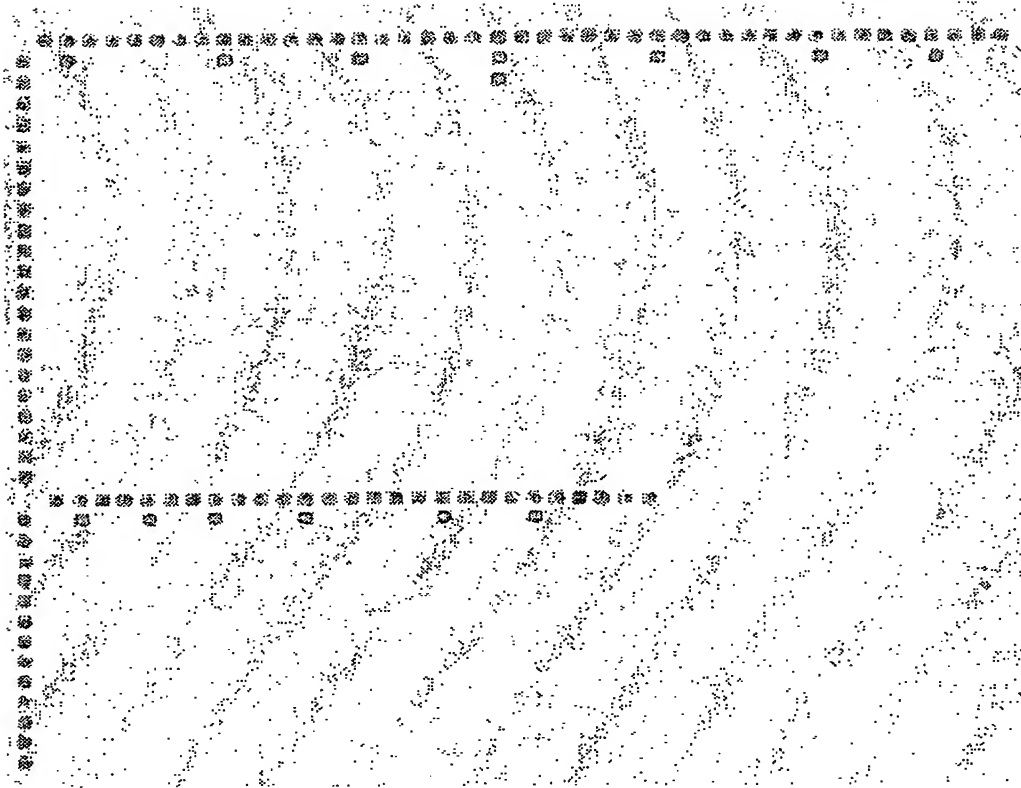
333

B	B	B	B
			799
796	797	798	

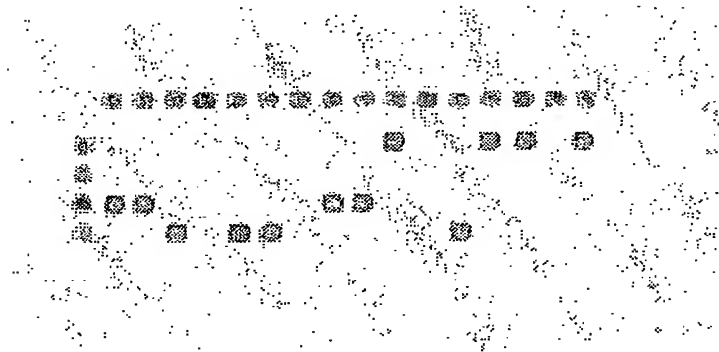
Fig. 22A

[illegible]

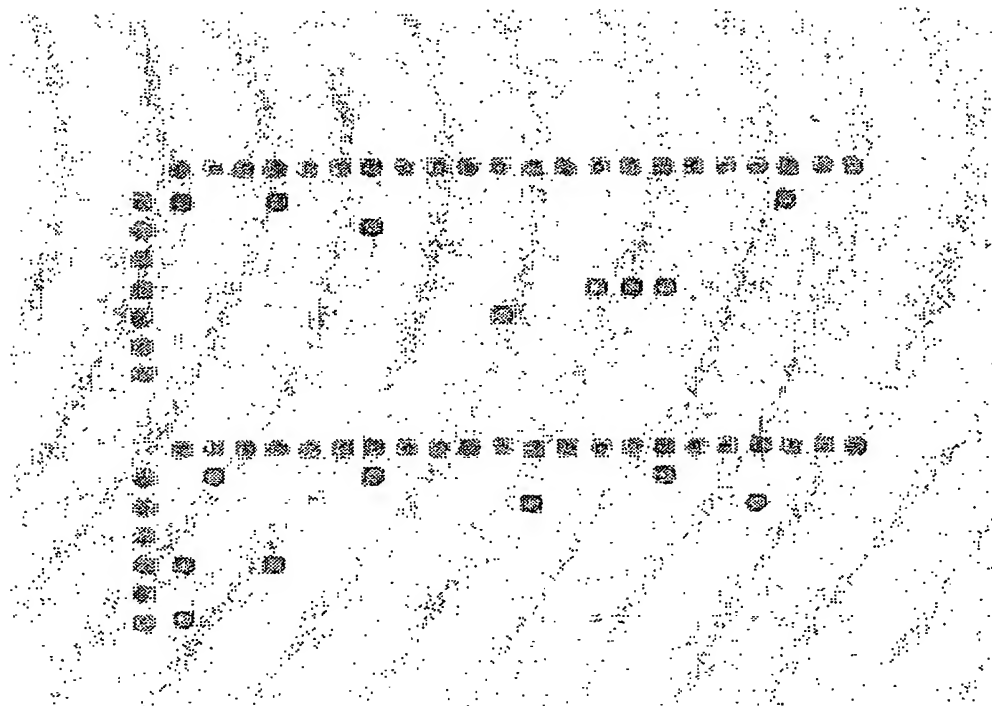
*Fig.20B*



*Fig.21B*

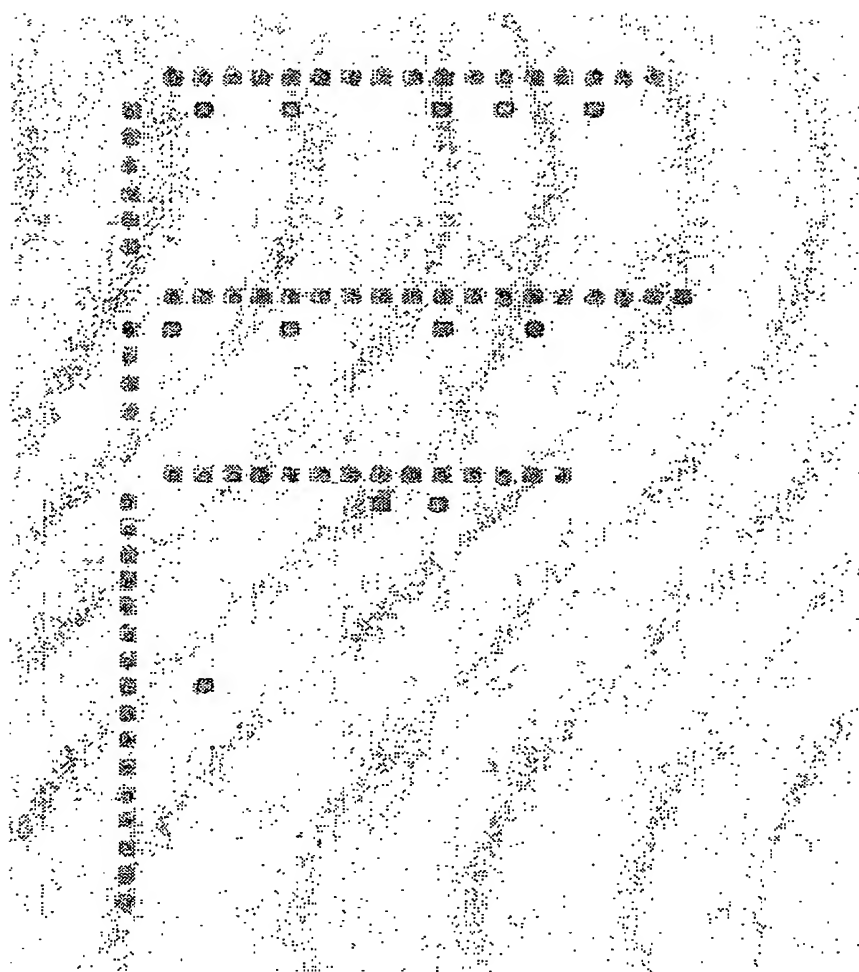


*Fig.22B*



[illegible]

*Fig.23B*

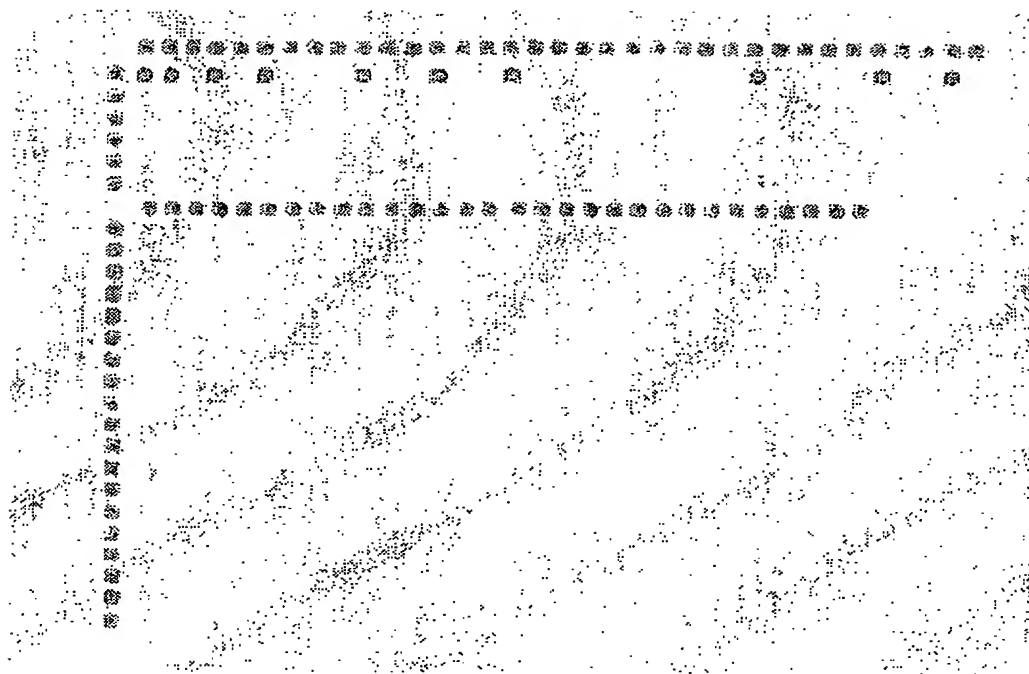


**Fig. 24A**

[illegible]



*Fig.24B*



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/04662

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl <sup>7</sup> C12Q1/68, C12M1/00, C12N15/09, G01N33/53		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl <sup>7</sup> C12Q1/68, C12M1/00, C12N15/09, G01N33/53		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CA (STN), REGISTRY (STN), WPI (DIALOG), BIOSIS (DIALOG)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 6-90757 A (The Kitasato Inst., Mitsui Petrochemical Ind. Ltd.), 04 May, 1994 (04.05.94) (Family: none)	1-30
X	JP 6-303998 A (Sumitomo Electric Industries, Ltd.), 01 November, 1994 (01.11.94) (Family: none)	1-30
X	WO 94/21818 A1 (N.V. Innogetics S.A.) 29 September, 1994 (29.09.94) & EP 689609 A & US 5883238 A & JP 8-507690 A	1-30
X	WO 00/31295 A1 (Shionogi & Co., Ltd.), 02 June, 2000 (02.06.00), & AU 6004699 A	1-30
X	WO 00/65088 A (AMERSHAM PHARMACIA BIOTECH AB), 02 November, 2000 (02.11.00), & AU 5062500 A	1-30
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* "A" "E" "L" "O" "P"	Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
Date of the actual completion of the international search 04 September, 2001 (04.09.01)		Date of mailing of the international search report 18 September, 2001 (18.09.01)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/04662

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-135081 A (Kazusa DNA Kenkyusho, O uji Seiyaku K.K., Mitsui Chemicals, Ltd.), 16 May, 2000 (16.05.00) (Family: none)	1-30
A	JP 2000-83647 A (Toshiba Corporation), 28 March, 2000 (28.03.00) (Family: none)	1-30
A	WO 89/10977 A1 (Oxford Jean Technology Limited), 16 November, 1989 (16.11.89), & EP 373203 A & US 5700637 A & JP 3-505157 A	1-30

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/04662

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

The inventions as set forth in claims 1 to 19 and 24 to 30 are regarded as a group of inventions relating to a typing kit for determining the genotype of a test sample HLA and a determination method with the use of the same.

On the other hand, the inventions as set forth in claims 20 to 23 are regarded as a group of inventions relating to primers for amplifying test sample HLA class I antigen or class II antigen genes.

Although these two groups of inventions have a common matter of being inventions relating to a test sample HLA, it has been well known that test sample HLAs per se vary among individuals. Thus, it does not appear that there is a technical relationship between these groups of inventions involving any special technical feature merely based on the fact of relating to a great number of different test sample HLAs.

Such being the case, these two groups of inventions are not considered as relating to a group of inventions so linked as to form a single general inventive concept.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest.  
☒ No protest accompanied the payment of additional search fees.

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